Economics of Environmental Improvement

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Executive Summary: Economics of Environmental Improvement

This report summarizes the results of over 4,000 survey responses to estimate the value of changes in water quality. Water quality is defined as the percent of lake acres and river miles that are 'good' in a 100 mile radius from the respondent's home. Water quality is 'good' if the water is safe for swimming, if fish from the water are safe to eat, and if the lakes and rivers sustain a varied and healthy aquatic environment. Respondents provided valuations through a series of choices between regions with better water quality and higher cost of living versus regions with lower water quality and lower annual cost of living. The key findings are summarized below:

Regional Water Quality Value

- The tradeoff between water quality and the annual cost of living has a value of $31 for each 1 percent in the level of lakes and rivers in the region rated "good" for fishing, swimming and aquatic uses. The median value was $15 per 1 percent rated good.

Water quality values depend on the demographic and behavioral characteristics of the respondent in the expected manner.

- Respondents with higher valuations tend to have higher educational attainment, higher incomes, are older, are environmental organization members, have taken recent visits to lakes or rivers, and have greater lake density in their home state.
- Respondents with lower valuations are more likely to have larger households.

Initial tradeoff offered to respondents affects final water quality value

- The greater the starting tradeoff between cost of living and water quality that is presented to a respondent, the greater is the final water quality value, suggesting that the tradeoffs presented have an anchoring effect on respondents' values.

Level of water quality presented to respondents affects final water quality value

- Higher water quality base rates (such as 70% - 90% instead of 50% - 70%) lead to lower incremental water quality values, suggesting that water quality as a good exhibits decreasing marginal value.

Information on national water quality level affects final water quality value

- Respondents who are told the national water quality level have greater values for incremental water quality improvements for water quality levels that are below that level, and exhibit a lower value for improvements above that level, suggesting that respondents use national information as a reference point.

National Water Quality Value

- The annual cost of living increase trade-off for each 1% point increase in national water quality had a value of $39 and a median of $20. This value is measured as an iterative referendum after the regional trade off.

Relative Importance of Recreational Uses

- The relative priority shares or utility weights for recreational uses of water quality are 35.2% for Fishing, 30.0% for Swimming, and 34.8% for Aquatic Environment. The ratios of these percentages correspond to the rates of tradeoff between the different attributes.

Relative Importance of Lakes vs. Rivers

- There is a significant preference for lake improvements over river improvements, suggesting a 53.1% priority for lake improvements and 46.9% for river improvements.

Time Discounting of Improvement Benefits

- The annual discount rate for water quality improvements declines from 14.4% for a delay of 0-2 years, to 8.4% for a delay of 2-4 years, and 8.7% for a delay of 4-6 years.

SECTION 1. OVERVIEW

This report summarizes both the survey methodology and the important results from a series of surveys that assessed citizen valuation of improvements in water quality. Although the information in this report has been funded wholly or in part by the United States Environmental Protection Agency under Cooperative Agreement No. CR823604 and Grant No. R827423 with Harvard University, it does not necessarily reflect the views of the Agency and no official endorsement should be inferred. Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

This report reviews data obtained from 4,257 respondents, who were surveyed in six waves. The sampling periods for these waves began in October 2002, February 2003, April 2003, April 2004, August 2004, and October 2004 (See Appendix A).

1.1 Research methodology:

Our research objective has been to develop a survey that could elicit scientifically credible water quality benefit values. To do so, we have used an interactive computer-based methodology that encourages respondents to think about how much they value both water quality and cost of living. Then the survey elicits the individual's valuation through a series of iterated choices, as well as with conjoint question sets. Because a variety of concerns have been raised about the use of contingent valuation estimates, we decided to use stated preference and conjoint formats. There is substantial literature confirming the validity of the conjoint method,[1] and we are confident that our estimates provide a meaningful reflection of improvement values for recreational water quality, We believe that the Knowledge Networks panel has proven to be an appropriate approach to obtaining the sample for our study.

Knowledge Networks (KN) administered the internet-based study on their national panel under a subcontract. The average completion rate for the six waves was 75%. Sections 2 and 3 provide a detailed analysis of the performance of the KN sample on a variety of key dimensions. Overall, the demographics of those surveyed closely match the demographic profile of the US adult population (Section 2B).

The statistical analysis explicitly tested for significant selection effects based on which members of the KN panel chose to participate in the survey. We used the Heckman sample selection correction approach to adjust our estimates for these influences.

The survey included rigorous tests of rationality to ensure that the responses were meaningful. Five percent of respondents were deleted from some analyses because they made logically inconsistent choices. That is, even when questioned, they still preferred a dominated item that was worse on either cost of living or water quality, but the same on the other attribute. The low level of these inconsistent responses provide additional basis for confidence in the findings.

We also tested several dimensions of the KN survey methodology, and these were found to have minimal impact on the derived water quality valuation. These tests included examination of variables such as length of time that the respondent has been a member of the KN panel and the length of time the respondent took to complete the survey.

[1] See Flaschbart et al (1981), Louviere (1988), Vavra et al (1999)

1.2 Regional Water Quality Values

The primary estimate of the value of water quality employs a series of iterative choices between two possible living locations that differ on the percent of water bodies with good quality in the region (Percent Good) and annual cost of living. For example, one region may be 20 percentage points better in terms of the percentage of water that is rated good but cost $400 more in cost of living per year. A person who indicates indifference between these two regions is willing to pay $400 for an extra 20 percentage point improvement in water quality value, or a unit value of $20 per point improvement. Iterative choices continue until respondents reach a point of indifference or we are able to place bounds on that point of indifference. Up to five iterated choices permitted close bounds for an individual's values. For still other respondents, only an upper or lower bound is known because they reach the boundary of the decision tree. These responses are treated as censored observations in our analysis.

The value is $31, and the median value is $15 for each percentage point in the level of water rated "good" in a respondent's region.

Factors influencing regional values:

While the survey results do yield an average value of water quality for the sample population, the objective of the analysis was not just to generate a single average water quality benefit value, but also to provide the empirical basis for a regression equation characterizing water quality values. EPA consequently could use this equation to project the results to any sample for which accurate census data exist.

1.2A Demographics: A regression predicting the dollar value of good water quality as a function of a variety of demographic variables yielded many results of policy interest as well as findings that provide tests with respect to economic hypotheses.

Water quality valuations exhibited the following significant effects of respondent characteristics:

1. A positive income effect, which is consistent with water quality being a normal good.
2. A positive education effect, which one would expect to the extent that education is a proxy for lifetime wealth.
3. A positive age effect, presumably reflecting life cycle effects.
4. Household size had a negative effect.
5. State lake density had a positive effect, reflecting higher valuations of people who have chosen to live in regions with high lake density.
6. A positive effect of being a member of an environmental organization or having visited a lake or river, each of which are measures of particularly high valuations of water quality.
7. Once demographic and behavioral characteristics were controlled, then there were minimal regional effects. This finding suggests that EPA can use our results to estimate average regional benefit values, with little need to modify the benefit amounts from the standpoint of regional differences.

1.2B Survey starting ratio: The surveys used different starting ratios of cost of living to water quality to examine whether the starting water value ratio mattered. The starting water value ratio is the valuation embodied in the first choice in the sequence of iterative choices offered to respondents. Across surveys, people experienced start ratios that ranged from $5 to $30 per percent of water rated good. As expected, starting ratio matters, as people with higher start ratios have higher final values. The underlying principle in our studies for minimizing starting point bias is that the start ratio should be chosen so that the representative respondent is equally likely to choose either of the two initial options presented. Information from survey results were used

to define appropriate starting ratios, and where starting ratios did not meet this equitable goal, value estimates can be adjusted in order to minimize starting ratio influences. Overall, the survey results that are not adjusted for starting ratio influences are very close to the estimate of $30 that would be expected if all respondents faced the equitable starting ratio.

1.2C Survey starting water quality level: We tested whether the initial percentages of good water in the two regions had an effect on the value of water quality. We found that higher starting water quality levels resulted in lower water quality level values per unit of water quality, demonstrating water quality to be a good with diminishing marginal value.

1.2D Information: Some survey versions provided respondents with information on the national percentage of water that is rated good. Providing reference information about the national level of water quality did not significantly affect the average valuation of water quality benefits. However, when interacted with the starting water quality level, there was a significant effect. This result suggests that differences in water quality valuations depend on whether the changes are perceived as losses or gains with respect to a reference point.

1.3 National Water Quality Referendum

Following the assessment of regional water quality values, the survey asked respondents to vote on a national referendum that would improve *national* water quality and increase *national* cost of living, including their own living costs. There were several reasons for including a referendum. First, it provides a test of the stability and validity of the regional water quality values. Second, and perhaps more importantly, the referendum implicitly includes non-use values as well as non-incurred expenses. Thus voting to accept a referendum reflects the valuation of benefits that others will experience and reaction to the costs that all must bear.

Overall, the value for the national referendum was $39 for a one percentage point increase in good water quality, with a median of $20. Regression analysis of the results of the national referendum indicated that the same demographic factors that influenced the regional value also influenced the national value. The initial cost of the policy differed across respondents between $200 to $500, and the initial improvement in water quality varied from 10% to 25%. The pattern of responses was quite consistent with what one would expect. Higher cost levels decreased and greater improvements in water quality increased the likelihood of support for the initial referendum, and as in the regional assessment, higher starting water ratios led to higher average values.

An additional comparison between regional and national improvements was done by pooling regional and national values and considered only those respondents with values for both (this estimate therefore excluded respondents from the first three rounds of the survey). This analysis estimated a regional value of $29, and a national value of $34. Overall, national values are shown to be higher than regional values, by a margin of 17% to 26%, depending on the analysis used.

1.4 Relative Value of Improvements to Fishing, Swimming, and Aquatic Environment

To establish the valuation of the dimensions of water quality—fishing, swimming, and aquatic environment effects—we used a choice-based conjoint approach. This methodology permitted the estimation of the relative value of these three components of water quality. Respondents made choices in six questions with two alternatives each that displayed different changes in water quality for fishing, swimming, and aquatic environment, where these effects are either at the national or regional level. The results indicated that a utility function for the percentage of water rated good can be decomposed into one with these components by providing 34.8% of the weight to point changes in aquatic environment, and 35.2% to fishing changes, and

30.0% to swimming changes (Section 6). These relative weights did not appreciably change based upon whether the improvements were national or to the home region.

1.5 Relative Value of Improvements to Lakes and Rivers

Throughout all of our survey rounds, respondents have shown a preference for lake improvements over river improvements. Results suggest that improvements to lakes should get a weight of 53.1%, compared with 46.9% for improvements to rivers.

1.6 Impact of Delays on the Value of Water Quality Improvements

An additional rationality test that we explored was to determine if people prefer a given improvement in water quality in the current period rather than in the future, as economic theory would predict. Such choices do arise in actual policy contexts. Sometimes improvements in water quality occur only after a pause in time. It is important to know how much citizens value having the benefit occur earlier. To estimate the time value of improvements, respondents made choices among policies that differed in price, the change in percent good, and when that change would occur. The time spans varied from 0 to 6 years. Based on the conjoint analysis, we found that the annual discount rate for water quality improvements declines from 14.4% for a delay of 2 years, to 8.4% for a delay of 4 years, and 8.7% for a delay of 6 years.

Additionally, the choice-based conjoint permitted further triangulation on the value of a one-percentage point change in water rated good. That trade-off averaged $23, an amount that is similar to the estimate generated by quite different methods in our regional water quality valuation paired comparison survey segment.

1.7 Structure of the Report

The report that follows will discuss the topics above in more detail. Beginning with the survey approach (Section 2) which includes survey response, demographics, and participation details, we will move on to the results of the regional water quality benefit value (Section 3) which provides a review of the question format, results, and various tests on those results. Next will be a discussion of our tests of the survey panel (Section 4), where we determine whether characteristics of the panel members affected survey results. Following that will be a discussion of the national referendum question (Section 5), including the question format, results, and comparison of the national results to regional results. Next we will consider the individual uses of water quality and lake vs. river preferences (Section 6), wherein we attribute priority shares of improvements to the three recreation uses of water quality and between the two inland water body types. Next will be time discounting of improvements (Section 7), where the valuation of improvements given different periods of delay will be measured. We will end with a discussion of application of the results (Section 8), where we consider the value that would be associated with a restoration of lake and river water quality from 2000 levels to 1994 levels as reported in the National Water Quality Inventory.

SECTION 2. SURVEY APPROACH

The survey we designed was a computer-based survey that we administered via the Knowledge Networks web-based panel. Appendix A provides a brief summary of the KN sampling methodology for those who are unfamiliar with it. Additional information is available from KN on their survey approach. However, the focus of the discussion here is on how the KN sample performed for this survey. What was the completion rate? Was the sample representative of the national adult population? Evidence presented in this section indicates that the KN sample performed well on each of these counts. We explore additional tests of the validity of the KN approach in subsequent sections.

Focus groups were used at the very early stages of survey design to ensure that the question format and subject matter were understandable to respondents. In addition, a small number of in-person interviews including within-survey and post-survey debriefing were conducted to address certain questions EPA had about the design. Finally, the survey itself allowed for respondents to make comments at the end of the instrument to communicate any concerns, questions, or confusion they may have had.

Members of the KN panel received a monetary incentive of $10 to take the survey, which took approximately 25 minutes to complete. There were six survey rounds, each survey was fielded for a period of either one or three months, with the earlier surveys having longer field times to gauge response effects of reminders to non-respondents. The survey was administered in six rounds over a two-year period. The three early rounds tested some survey questions and formats that were not retained or were improved to their final versions. Other questions used different levels of cost and quality within and between rounds. The bulk of the survey was administered in three rounds over six months, from late April to early October of 2004. The three final rounds were used in order to ensure that any unexpected respondent confusion could be addressed. The final round of about 2,000 completed interviews was fielded when we were confident that the instrument was clear and error-free.

2.1 Survey Response

The average completion rate was 75% for the six survey rounds, which exceeded our target completion rate of 70%. More specifically, the completion rates and field dates of each of the survey rounds are described in Table 2-1 below.

Table 2-1: Survey Field Dates and Response Rates

Implementation	Round 1	Round 2	Round 3	Round 4	Round 5	Round 6
Date Fielded	November, 2002	February, 2003	April, 2003	April, 2004	August, 2004	October, 2004
Invitees	231	547	809	722	720	2626
Completed Interviews	185	407	582	551	518	2014
Consistent Responses	174	381	548	530	488	1920
Completion Percentage	80%	74%	72%	76%	72%	77%

2.2 Survey Demographics

The demographic profile of respondents was very similar to that of the U.S. population. Table 2-2 provides a detailed comparison of the distribution of survey participants as compared to the U.S. population. The dimensions considered are employment status, age, education, race, gender, marital status, and income. The correspondence between the sample and national characteristics is extremely close. The sample had fewer college graduates and above than did the national sample, the opposite of the sampling problem usually hypothesized for a computer-based sample. The distribution of respondents by income group displays a pattern of slight under sampling of people in the lowest income groups. Minorities are well represented in the survey. Overall, there was a superb match-up of the survey participants to the national demographic statistics.

Table 2-2: Comparison of KN Sample to the National Adult Population[2]

Demographic Variable	Survey Participants (n=4257) Percent	US Adult Population Percent
Employment Status (16 years or older)		
Employed	61.3	62.3
Age		
18 - 24 years old	13.4	13.3
25 - 34 years old	20.1	18.3
35 - 44 years old	19.4	20.4
45 - 54 years old	18.6	18.7
55 - 64 years old	11.9	12.2
64 - 74 years old	11.7	8.4
75 years old or older	4.9	8.1
Educational Attainment		
Less than HS	18.5	15.4
HS Diploma or higher	59.4	57.4
Bachelor or higher	22.2	27.2
Race / Ethnicity		
White	80.3	81.9
Black/African-American	13.3	11.8
American Indian or Alaska Native	1.6	0.9
Asian/Pacific Islander/Other	4.8	5.5
Race / Ethnicity of Household		
Hispanic	10.6	12.1
Gender		
Male	51.0	48.5
Female	49.0	51.5
Marital Status		
Married	58.4	58.8
Single (never married)	25.6	24.4
Divorced	10.9	10.2
Widowed	5.1	6.6
Household Income (2002)		
Less than $15,000	15.0	16.1
$15,000 to $24,999	11.6	13.2
$25,000 to $34,999	12.5	12.3
$35,000 to $49,999	18.8	15.1
$50,000 to $74,999	18.2	18.3
$75,000 or more	23.8	25.1

[2] *Statistical Abstract of the United States, 2004-5*. 2003 adult population (18 years+), unless otherwise noted.

2.3 Survey Participation

Table 2-3 reports the logit regression for whether the individual in the panel chose to participate in the survey after having been invited to do so. The number of observations for this regression is slightly lower than that reported in Table 2-2 due to missing data for certain explanatory variables. The dprobit results reported are probit regression estimates for which the coefficients have been transformed to equal the marginal effects.

Older panel members were more likely to participate in the survey, as were those who were married.

Less likely to participate were black panel members, Hispanic panel members, panel members from large households, and panel members who owned their residence. Panel members reporting a high level of stress were less likely to participate in the survey, as were those panel members who did not provide an answer to that question. Also, panel members who retired from the KN panel within 5 months of the date their survey round closed were less likely to participate.

Table 2-3: Logistic and Dprobit Regressions on Survey Participation Probability

Did the Invited Panel Member Participate in the Survey

	Logistic		DProbit	
Variable	Odds Ratio	Standard Error	dF / dx	Standard Error
Log (Income)	1.0172	0.0472	0.0026	0.0070
Years of education	1.0069	0.0167	0.0013	0.0025
Age	1.0083 ***	0.0030	0.0013 ***	0.0005
Race: Black	0.6408 ***	0.0684	-0.0748 ***	0.0184
Race: Non-black, Non-white	0.8162	0.1245	-0.0361	0.0254
Hispanic	0.7302 ***	0.0843	-0.0521 ***	0.0197
Gender: Female	0.9605	0.0751	-0.0073	0.0118
Household Size	0.8688 ***	0.0252	-0.0219 ***	0.0044
Region: Northeast	0.8703	0.1059	-0.0226	0.0192
Region: South	0.9471	0.0985	-0.0102	0.0159
Region: West	0.9697	0.1155	-0.0069	0.0182
Currently Employed	0.8874	0.0780	-0.0173	0.0131
Not living in 150 largest MSA's	0.9506	0.0984	-0.0073	0.0159
Owner of Residence	0.7732 ***	0.0713	-0.0398 ***	0.0135
Marital Status: Married	1.2441 **	0.1129	0.0340 **	0.0138
Dual Income Household	0.9987	0.0863	0.0023	0.0130
Head of Household	0.9044	0.0923	-0.0147	0.0151
Time as Panel Member, in Months	0.9955 *	0.0027	-0.0007 *	0.0004
Stress Level	0.7011 ***	0.0636	-0.0546 ***	0.0138
Stress Data Missing	0.3115 ***	0.0369	-0.2131 ***	0.0238
Respondent Retired from KN Panel	0.0804 ***	0.0064	-0.4774 ***	0.0146

N	Complete= 1	Complete= 0
5639	4246	1393

Notes: * significant at .10 level, ** significant at .05 level, *** significant at .01 level, all two-tailed tests.

SECTION 3. REGIONAL WATER QUALITY BENEFIT VALUES

3.1 Regional Value Question Format

The primary benefit value of interest is how people value different levels of water quality rated "good." To elicit these values, we presented respondents with pair-wise comparisons of two regions that differ on two dimensions—water quality and the cost of living. Respondents indicate a preference between the two regions, and the choices are altered until the respondent reaches indifference. Depending on the respondent's answer, the survey alters either the cost of living or the water quality level in the subsequent questions.

This methodology is illustrated by the sample initial question in Figure 3-A. We initiated this methodology in the environmental literature more than a decade ago. It has been adopted in studies by other researchers as well. We have validated this methodology in a variety of ways, such as obtaining estimates of the tradeoff values for which there was a comparison market counterpart, such as the value of statistical life. The attractiveness of the approach is that it makes it clear to respondents that there is in fact a tradeoff, and it is couched in a manner that is reflective of a realistic payment mechanism. Moreover, the survey structure forces respondents to consider moving to one of two regions and to focus on the tradeoffs between these regions. This formulation also encourages respondents to abstract from the specific aspects of their home region, avoiding local issues that would have been very difficult to monitor through survey questions.

Figure 3-A: Sample Regional Water Quality Benefit Question

We would like to ask you some more questions like these. However, in these questions, one region will have a lower annual cost of living and the other will have higher water quality. **Remember that the national average for water quality is 65% Good.**

	Region 1	Region 2	
Increase in Annual Cost Of Living	**$100** More Expensive	**$300** More Expensive	
Percent of Lake Acres and River Miles With Good Water Quality	**40%** Good Water Quality	**60%** Good Water Quality	
Which Region Would you Prefer?	Region 1 *	Region 2 *	No Preference *

Questions of this form continue until indifference is reached, until the respondent's value is known within bounds above and below their value, or until an upper or lower bound is reached followed by a question to test whether the respondent is being attentive to the survey task. Subsequent questions change the water quality or cost in the regions depending on a respondent's answer. Appendix B provides a detailed breakdown of the structure of the sequence of survey questions that follow the initial question.

Note that respondents are valuing quality differences of a magnitude greater than a single percentage point. However, in order to standardize the reporting of results, a respondent's value will be reduced to the ratio of (the cost of living increase accepted) over (a single percentage point difference in improvement).

3.2 Regional Value Survey Results

For the six rounds of the survey, the mean value per 1 percent of water quality rated good was $31, the median value was $15, with a standard error of 0.158 for 4033 respondents.[3]

If an adjustment is made to reflect the different starting values for water quality and cost of living differences, the values were stable across the different rounds. Since the six rounds do not yield significantly different results, they will be pooled together and will not be discussed further individually.

Table 3-1: Censored Regression Results Testing Significance of Different Survey Rounds*

	Log (Dollar Value for 1% Better Water Quality)	
Variable	Parameter Estimate	Standard Error
Round 1	-0.0426	0.1238
Round 2	0.1434	0.0947
Round 3	-0.0787	0.0882
Round 4	-0.0158	0.0618
Round 5	0.0715	0.0650
	N	Psuedo R-square
	4033	0.0237
	(376 left censored)	
	(403 right censored)	

* Round 6 was the excluded variable. This regression also considered demographic variables and survey differences between respondents.

Table 3-2 presents regression results for the log value of the unit water benefit value for the respondent's region. Higher income respondents have a higher value for water quality, as do those respondents with a higher level of education.

The two variables that reflect stronger valuations of environmental amenities each have the expected sign and are statistically significant. Specifically, there is a positive effect of being a member of an environmental organization as well as a positive effect for the variable capturing whether a person has visited a lake or river in the past year. People who use water should exhibit higher values, as is the case.

Of the various demographic variables, age has a significant effect indicating a positive relationship between age and water quality value, black respondents have lower water quality values than other races, as do respondents in larger households. The other demographic variables analyzed were not statistically significant. Of the regional variables, the geographic variables were not significant. However, lake acres per square mile in the respondent's state, which is an indicator of water abundance, did show a positive effect, suggesting that respondents who have chosen to live in states with greater access to water value water quality more highly.

[3] This number was derived from a censored regression equation accounting for demographic characteristics, possible survey biases, and responses above or below the observed maximum or minimum values presented. The difference between the model and the raw observed numbers can be seen in Table 5-1.

Also, since greater lake density means that more water bodies would have good quality for a given percentage increase, the positive effect could indicate that respondents value improvements more highly when those improvements affect more water bodies.

Table 3–2: Censored Regression Results for Log of Unit Water Quality Benefit Value

Consistent Sample, Including survey collected demographic variables	Log (Dollar Value for 1% Better Water Quality)	
Variable	Parameter Estimate	Standard Error
Log (Income)	0.1204 ***	0.0234
Years of education	0.0403 ***	0.0082
Age	0.0063 ***	0.0012
Environmental Organization Membership	0.5328 ***	0.0898
Visited a Lake or River, last 12 Months	0.2063 ***	0.0437
Race: Black	-0.1417 **	0.0611
Race: Non-black, Non-white	0.0054	0.0838
Hispanic	0.1037	0.0669
Gender: Female	-0.0455	0.0399
Household Size	-0.0314 **	0.0156
Region: Northeast	0.0248	0.0621
Region: South	-0.0459	0.0564
Region: West	-0.0215	0.0616
State Lake Quality	0.0003	0.0008
Lake Acres per State Square Mile	0.0044 **	0.0022
INTERCEPT	0.4560 *	0.2607
	N	Pseudo R-square
	4033 (376 left censored) (403 right censored)	0.0166

Notes: * significant at .10 level, ** significant at .05 level, *** significant at .01 level, all two-tailed tests.

We also performed robustness tests of the results based on the Heckman selectivity bias correction. We show that the pattern of people in the KN sample who chose to respond to the survey made very little difference in the results. The variable that we used to identify the model was the person's reported stress level, which is an additional variable that KN obtains from members of its panel (see Appendix C). In addition, the model is also identified off of functional form.

3.3 Tests of Regional Water Quality Values

3.3A Adjustment for extreme responses

There were two ways that responses had to be treated differently because they were extreme. First, respondents may have continued until they reached an extremely highly high or extremely low value of water quality. For these extreme responses, we treat their responses as censored. Second, respondents also had the option to continue down the tree until they accepted a dominated choice, one that is equal on one attribute but worse on the second. In those cases we asked whether they still wanted to make the dominated choice. Five percent of respondents indicated they still did. We interpret these as protest responses.

These protest responses were about twice as likely to arise from those preferring good water quality as from those preferring low cost of living (139 of the 208 inconsistent respondents preferred higher water quality). However, in analyzing these responses the analysis differs little depending on whether we treat them as missing or censored. Because of the economic irrationality displayed by the preference for a dominated alternative, we decided to exclude these responses from our analyses.

3.3B Base water quality level

To test whether the general level of good water in the two regions had an effect on the incremental value of water quality, respondents were given different base water quality levels (we define base level as the lower of the two water quality levels in the first question of the region choice question set, see Appendix B). As Table 3-3 indicates, higher base water quality levels resulted in lower water quality improvement values, demonstrating water quality to be a good with diminishing marginal value. The regression suggests an improvement value of $31 at the mean base quality of 53%, with a range of $45 at the lowest base quality of 20% to $26 at the highest base quality of 70%.

Table 3-3: Censored Regression of Log Water Quality Values Including Starting Water Quality Level Effects

Consistent Sample, Including survey collected demographic variables	Log (Dollar Value for 1% Better Water Quality)	
Variable	Parameter Estimate	Standard Error
Log (Base Water Quality Level)	-0.4263 ***	0.0920
Log (Starting Water Quality Tradeoff)	0.5374 ***	0.0635
Log (Income)	0.1255 ***	0.0231
Years of education	0.0394 ***	0.0080
Age	0.0063 ***	0.0012
Environmental Organization Membership	0.5197 ***	0.0885
Visited a Lake or River, last 12 Months	0.1944 ***	0.0431
Race: Black	-0.1288 **	0.0603
Race: Non-black, Non-white	0.0139	0.0826
Hispanic	0.1108 *	0.0659
Gender: Female	-0.0437	0.0393
Household Size	-0.0300 *	0.0154
Region: Northeast	0.0289	0.0612
Region: South	-0.0359	0.0556
Region: West	-0.0155	0.0607
State Lake Quality	0.0004	0.0008
Lake Acres per State Square Mile	0.0044 **	0.0021
INTERCEPT	-1.3463 ***	0.3365
	N	Pseudo R-square
	4033 (376 left censored) (403 right censored)	0.0222

Notes: * significant at .10 level, ** significant at .05 level, *** significant at .01 level, all two-tailed tests.

3.3C National information

Half the respondents received information about the percentage of water in the country that is rated good, which is about 65% (according to the 1994 EPA Water Quality Inventory, though this level has fallen a bit in subsequent years.[4]). This information may assist respondents in putting the survey figures into context. Respondents also might have a distinct valuation of water relative to the national average that is a legitimate reflection of their underlying preferences in much the same way that people may care about their relative

[4] According to the National Water Quality Inventory Reports to Congress, in 1994, 64% of rivers and 63% of lakes were rated good, in 1996, those numbers were 64% /61%, in 1998 they were 65%/55%, and in 2000 they were 61%/54%.

economic status. This influence of the national value also could reflect potential anchoring effects. By itself, this information did not affect water quality benefit values on average.

However, as Table 3-4 shows, if whether the respondent received national information is interacted with the base water quality level (see previous section), the interaction variable is significant and negative. The coefficient of base water quality level increases greatly (-.42 + -.46 = -.88) when told but becomes near zero (-.42 + .46 =.04) when not told. This pattern suggests that providing national water quality information serves as the reference point for whether changes to water quality are perceived as gains or losses.

Table 3-4: Censored Regression of Log Water Quality Values Including Information Effects

Consistent Sample, Including survey collected demographic variables	Log (Dollar Value for 1% Better Water Quality)	
Variable	Parameter Estimate	Standard Error
Respondent Told National Quality Level (zero centered)	-0.0396	0.0393
Log (Base Water Quality Level) (zero centered)	-0.4206 ***	0.0920
Told (zero centered) X Log (Base Quality) (zero centered)	-0.4617 ***	0.1568
Log (Starting Water Quality Tradeoff) (zero centered)	0.5251 ***	0.0639
Log (Income)	0.1240 ***	0.0231
Years of education	0.0392 ***	0.0080
Age	0.0062 ***	0.0012
Environmental Organization Membership	0.5275 ***	0.0885
Visited a Lake or River, last 12 Months	0.1930 ***	0.0431
Race: Black	-0.1270 **	0.0602
Race: Non-black, Non-white	0.0165	0.0825
Hispanic	0.1077	0.0658
Gender: Female	-0.0478	0.0392
Household Size	-0.0294 *	0.0153
Region: Northeast	0.0262	0.0611
Region: South	-0.0400	0.0556
Region: West	-0.0174	0.0606
State Lake Quality	0.0004	0.0008
Lake Acres per State Square Mile	0.0044 **	0.0021
INTERCEPT	0.4332 *	0.2568
	N	Pseudo R-square
	4033 (376 left censored) (403 right censored)	0.0229

Notes: * significant at .10 level, ** significant at .05 level, *** significant at .01 level, all two-tailed tests.

3.3D Alternative Estimation of Regional Value, First Decision Only

While the iterated question set reveals an estimated value for each respondent, many structural characteristics of the survey and demographic effects are apparent from only the first question in the set. As the table below shows, base quality, national information, and several demographic variables are significant from the first choice. This regression also shows that respondents are less likely to choose the higher cost and higher quality region when the cost difference is higher relative to water quality difference.

Table 3-5: Logistic Regression of First Choice in Regional Value Question Set

Consistent Sample, No Preference Answers Deleted	Did Respondent Choose Higher Cost/Higher Quality Region	
Variable	Parameter Estimate	Standard Error
Respondent Told National Quality Level (zero centered)	0.00608	0.0686
Log (Base Water Quality Level) (zero centered)	-0.8711 ***	0.1635
Told (zero centered) X Log (Base Quality) (zero centered)	-0.8944 ***	0.2815
Log (Starting Water Quality Tradeoff) (zero centered)	-0.6503 ***	0.1135
Log (Income)	0.2266 ***	0.0417
Years of education	0.0619 ***	0.0142
Age	0.0154 ***	0.00215
Environmental Organization Membership	0.9602 ***	0.1653
Visited a Lake or River, last 12 Months	0.2630 ***	0.0761
Race: Black	-0.1028	0.1060
Race: Non-black, Non-white	0.0896	0.1458
Hispanic	0.1519	0.1153
Gender: Female	-0.0848	0.0685
Household Size	-0.00780	0.0268
Region: Northeast	-0.0237	0.1067
Region: South	-0.1242	0.0972
Region: West	-0.0586	0.1057
State Lake Quality	0.000646	0.00134
Lake Acres per State Square Mile	0.00406	0.00374
INTERCEPT	-4.1584 ***	0.4702
	N = 3757	

Notes: * significant at .10 level, ** significant at .05 level, *** significant at .01 level, all two-tailed tests.

SECTION 4. SURVEY APPROACH VALIDITY TESTS

As additional verification of the soundness of the Knowledge Networks survey methodology we analyzed how the responses to the basic water quality benefit question varied with key variables describing various aspects of how respondents took the survey. These variables cannot be adjusted using the standard sample selection correction because the values of these variables cannot be known for those who did not take the survey. Instead we test the impact of four different measures in the water quality regression equation reported in Table 3-2.

4.1 Panel Variables Used as Validity Tests

The first variable described whether the respondent stopped the survey and then continued taking the survey at a later time. Conceivably such respondents might be less engaged in the survey task. However, there was no significant effect of this variable on benefit values.

The second variable of interest is the time the person has been a member of the Knowledge Networks panel. Length of time in the panel may affect attentiveness to the surveys, and potentially could be correlated with other personal characteristics that influence water quality valuations. The results fail to indicate any significant effect of this variable as well.

Third, the days the respondent took to complete the survey after first being offered that opportunity to participate could reflect a lack of interest in the survey topic or in taking surveys generally. This variable did have a significant but small negative effect. Given that respondents were told the general subject of the survey before taking it, this result could demonstrate a lower concern or interest in the subject matter exhibited in a delay to complete the survey.

Finally, if the respondent retired from the Knowledge Networks panel within five months of taking the survey (this duration was used so that all rounds could be analyzed for the same amount of time), that might be associated with a diminishing interest in taking surveys. The results did not show any significant effect on our results from this variable.

Overall, there is evidence that these key aspects of the Knowledge Networks methodology had minimal impact on the survey responses. The number of days a panel member took to complete the survey after being invited had a small but significantly negative effect on regional water quality value, but when demographic characteristics were included, the significance of that effect was lost. In addition, we performed comparable tests on whether the respondent failed the consistency test. The time as a panel member had a slightly positive effect on whether the respondent was inconsistent, even adjusting for demographic characteristics.

Table 4-1: Validity Tests Based on Censored Regression of Log of Unit Water Quality Benefit Values

Variable	Log (Dollar Value for 1% Better Water Quality) Parameter Estimate	Standard Error	Log (Dollar Value for 1% Better Water Quality) Parameter Estimate	Standard Error
Log (Income)	0.1216 ***	0.0234	-	-
Years of education	0.0394 ***	0.0082	-	-
Age	0.0069 ***	0.0013	-	-
Environmental Organization Membership	0.5298 ***	0.0897	-	-
Visited a Lake or River, last 12 Months	0.1940 ***	0.0440	-	-
Race: Black	-0.1425 **	0.0615	-	-
Race: Non-black, Non-white	0.0102	0.0838	-	-
Hispanic	0.1095	0.0670	-	-
Gender: Female	-0.0498	0.0400	-	-
Household Size	-0.0304 *	0.0156	-	-
Region: Northeast	0.0214	0.0621	-	-
Region: South	-0.0524	0.0566	-	-
Region: West	-0.0315	0.0619	-	-
State Lake Quality	0.0003	0.0008	-	-
Lake Acres per State Square Mile	0.0044 **	0.0022	-	-
Subject Stop and Continue Survey Later	-0.0938	0.0753	-0.0919	0.0772
Time as Panel Member, in Months	-0.0021 *	0.0012	-0.0001	0.0012
Days from Invitation to Completion	-0.0037	0.0025	-0.0067 ***	0.0025
Respondent Retired from KN Panel	-0.0115	0.0595	-0.0887	0.0607
INTERCEPT	0.5210 **	0.2624	2.6951 ***	0.0382
N	Pseudo R-square		N	Pseudo R-square
4033 (376 left censored) (403 right censored)	0.0172		4033 (376 left censored) (403 right censored)	0.0010

Notes: * significant at .10 level, ** significant at .05 level, *** significant at .01 level, all two-tailed tests.

4.2 Starting Point Ratios

To test for effects due to starting cost and quality differences, we examine how different initial water quality value ratios based on the ratio of cost of living differences to water quality differences could affect the ultimate choice of the unit water quality benefit value for the respondent. Should there be a desire to develop predictions based on regression estimates that adjust for the influence of the starting point, the regression results in Table 4-

2 include the log of the initial starting water quality ratio to capture the effect of starting ratios. This variable has a statistically significant positive effect on valuations. Including this variable in the equation had minimal impact on the significance of demographic characteristics on water quality values.

Table 4-2: Regression of Log Unit Water Quality Benefit Values Including Starting Ratio Effects

	Log (Dollar Value for 1% Better Water Quality)	
Variable	Parameter Estimate	Standard Error
Log (Starting Water Quality Value Ratio)	0.3825 ***	0.0542
Log (Income)	0.1234 ***	0.0231
Years of education	0.0406 ***	0.0081
Age	0.0064 ***	0.0012
Environmental Organization Membership	0.5137 ***	0.0888
Visited a Lake or River, last 12 Months	0.1920 ***	0.0432
Race: Black	-0.1398 **	0.0604
Race: Non-black, Non-white	-0.0020	0.0828
Hispanic	0.1095 *	0.0661
Gender: Female	-0.0441	0.0394
Household Size	-0.0276 *	0.0154
Region: Northeast	0.0192	0.0613
Region: South	-0.0472	0.0557
Region: West	-0.0241	0.0608
State Lake Quality	0.0004	0.0008
Lake Acres per State Square Mile	0.0047 **	0.0021
INTERCEPT	-0.6456 **	0.3015
	N	Pseudo R-square
	4033 (376 left censored) (403 right censored)	0.0229

Notes: * significant at .10 level, ** significant at .05 level, *** significant at .01 level, all two-tailed tests.

We propose that the initial starting ratio be set such that there is a 50%-50% split across the general population. We term this an "equitable" start in that each of the initial paths down the iterative tree has equal probability. At this start point, the implied valuation resulting from the sequence of decisions will equal the preferences of the median respondent on the initial choice. In our research, we had originally proposed that the starting ratio follow this property, but no single set of regional choices satisfied this criterion exactly. However, we have developed a series of alternative start points that bracket the 50-50 split. Moreover, we address the equitable start point issue with a choice model that can be used to determine the starting valuation ratio that is most likely to result in a 50%-50% split. The valuation from an equitable start can thus be estimated parametrically.

Table 4-3: Logit Regression on Probability of Choosing Higher Cost, Higher Quality Region

Variable	Did Respondent Choose the Higher Cost, Higher Quality Region Parameter Estimate	Standard Error
Log (Starting Water Quality Value Ratio)	-0.8672 ***	0.0941
INTERCEPT	2.3207 ***	0.2624

N	Chose= 1	Chose= 0
3757	1810	1947

Notes: *** significant at the .01 level, all two-tailed tests.

To estimate the starting value that would generate a 50%-50% split, we ran a logistic regression predicting the likelihood of choosing the item that is better on cost of living as a function of the log of the starting ratio (change in cost of living/change in % good water). The equation shown above in Table 4-3 is:

logit(choose higher cost of living) = 2.321 - .867 (log start ratio)

Solving this equation for the location of a predicted 50%-50% split produces an equitable start ratio of $14.52. If we then insert log (14.52) for the start ratio in the equation in Table 4.2, in which the other independent variables are at their mean, then that leads to an estimate for regional water quality value of $28.50.

4.3 Scope Test

To test whether respondents are merely expressing approval of environmental goods instead of expressing rational values reflective of their underlying preferences, we conducted a scope test. In Table 4-4, a logistic regression of the first question of the regional value survey question set considers the effects of different initial cost and improvement differences between the choices. As expected, increasing the cost of living difference between the regions leads to a decreased likelihood that the respondent will choose the higher cost region. Also, increasing the initial difference in water quality between the regions leads to an increased likelihood that the respondent will choose the higher quality region. This response to changes in the environmental good offered satisfies the across-subjects scope test.

Table 4-4: Scope Test, Logit Regression on First Question Response

Variable	Did the Respondent Choose the Higher Cost, Higher Quality Region Parameter Estimate	Standard Error
Cost Difference in First Question	-0.0025 ***	0.0004
Quality Difference in First Question	0.0357 ***	0.0044
INTERCEPT	-0.0109	0.1302

N	Chose= 1	Chose= 0
3757	1810	1947

Notes: *** significant at the .01 level, all two-tailed tests.

One other scope test, examining within-respondent differences by comparing regional values to national values is problematic due to differences in the question format, starting tradeoffs, and order effects. These differences prevent a definitive scope test from this comparison. However, it is possible that some respondents who express higher regional value than national value exhibit what Mitchell and Carson (1989) refer to as a part vs. whole problem and Heberlein (2005) discusses as negative affective scope due to this part vs. whole problem.

4.4 Summary of Survey Tests

As this section has shown, many consistency and rationality tests were conducted on this survey data to ensure that the value estimates are meaningful and can be applied to a wide variety of improvement scenarios.

The panel itself was tested to ensure that the survey sample was sound. Information about respondents' behavior in the panel (amount of time as a KN panel member, time from invitation to survey completion, whether the survey was taken in one sitting or with a break, and whether the panel member subsequently retired from the KN panel) was compared to their responses to the survey. As Table 4-1 shows, these factors had minimal impact on responses.

The sample drawn was compared to national demographics, showing that the estimates are generally applicable. As Table 2-2 shows, the sample closely mirrors the adult population of the United States. This does not prevent the use of these estimates for sub-populations and smaller areas, as long as adjustments are made based upon the characteristics of those areas and populations. An example of this can be found in section 8.2.

Information on geographic differences between respondents was collected, to account for value differences due to region of the country, levels of water abundance, and current level of water quality. As Table 4-2 shows, most of these variables do not significantly alter improvement values, though the abundance of lakes in the respondent's home region was shown to be significant.

Warm-up questions and definition sections were included to familiarize respondents with the concepts and the task. Cost of living was explained using a concrete example and the definition of "good" recreational water quality was laid out. Three warm-up questions allowed respondents to slowly acclimate themselves to how these concepts would be used in questions before the regional water quality question set began.

Consistency tests were included to ensure that respondents were attentive to the survey and provided rational responses. If respondents were careless or inattentive in their answers to iterated questions, they were challenged when they made an irrational choice. Protest responses were also challenged, and the small number of respondents whose answers reflected irrational choices (preference of worse water quality or preference for higher expense with all else equal) were excluded from analysis.

Baseline water quality levels were varied to measure value differences at different points in the continuum of possible improvements. As Table 3-4 shows, respondents who consider improvements to a higher starting baseline (for example, and improvement from 70% to 90% Good compared to an improvement from 20% to 40% Good) have significantly lower values for those improvements, reflecting diminishing marginal utility for improvement with higher water quality.

Starting ratios were varied to test and adjust for possible anchoring effects. As Table 3-4 shows, respondents do experience some anchoring based upon the starting ratio. However, as Table 3-5 demonstrates, respondents still respond rationally to higher starting tradeoffs (respondents are less likely to choose the higher cost region as the starting ratio of cost to quality increases). To account for the anchoring effect, a variety of starting tradeoffs

were tested, and a starting ratio where respondents' choices between regions in the initial question are even (half choosing region 1 and half choosing region 2) was used to minimize this anchoring.

The level of national water quality was provided to some respondents to test for information effects. Half of respondents were told that the national level of water quality was 65% Good. When considered alone, this information did not significantly affect improvement values, though significant differences were found when this information was interacted with baseline water quality. Respondents who were aware of the national water quality level had significantly lower values when presented with higher baseline quality, and had higher values when presented with lower baseline quality. This suggests that respondents use the national water quality level as a reference point.

Finally, a regression equation was developed, and included the above factors, enabling application of results to a wide variety of different improvement and demographic scenarios while accounting for effects that could bias results. Table 3-4 shows this regression (for regional improvements). Demographic information appropriate to the improvement situation can be applied to the coefficients, or national averages used where such information might be unavailable. Section 8 discusses application of results in a more detailed manner.

SECTION 5. NATIONAL REFERENDUM

5.1 National Value Question Format

The survey elicited values for national water quality improvements based on a referendum approach. Thus, respondents must indicate whether they would be in favor of a referendum that would increase all citizens' cost of living but would improve national water quality. As a result, this question set captured both use and nonuse values for improvements that affect the respondent's own region as well as improvements that affect the rest of the nation similarly. Figure 5-A presents a sample referendum question.

Figure 5-A: Sample National Referendum Question

Suppose you could vote on a policy that you are sure would improve the water quality in every region of the country, including your own, by **10%.** The entire United States is about 100 times the size of your region.

This policy would increase the cost of living by **$200** per year nationwide.

	Effect of Policy
Increase in Cost of Living	$200
Percent Increase Of Lake Acres and River Miles with Good Water Quality	10%

Would you be in favor of this policy?
Select one answer only

* Yes, I am in favor of this policy
* No, I am opposed to this policy
* I have no preference for whether this policy is done or not

This question set iterated in the same way as the primary question set, and had initial cost and improvement splits similar to the primary question set as well.

Notice that the referendum question entails a different tradeoff from the iterative regional choice question. In the regional choice question the benefits and the costs accrue only to the individual—the costs and benefits to others are unaffected by where an individual chooses to live. By contrast, the national referendum offers an incremental benefit of better water quality, and an incremental increase in cost of living to all citizens. One's willingness to vote for the change depends not only on one's personal tradeoff, but also on how the respondent feels about imposing these costs and benefits on others. Our past analyses of altruism suggest that people often have a strong sense that people in other regions should pay their own way. Thus, issues of fairness may enter. Additionally, more abstract ideas about how the respondent feels about the appropriateness or efficacy of national action to improve the environment could also make one more or less likely to vote for the referendum.

The national referendum differs from the regional choice in an additional way as well. The regional choice question pertains to a choice between regions with different fixed levels of water quality. Moreover, the base levels of water quality differ in the case of the regional choice but do not for the national referendum. In the case of the referendum, the valuation is for an improvement in water quality from its current level. Data for the national water quality referendum were only collected for the last three survey rounds.

It is important to note that the difference between the regional improvement value and the national improvement value is not simply a measure of non-use value. The regional value includes the non-use value for the respondent's own region as well as the use value for that region. We have found that respondents who have not visited a lake or river still value regional improvements, suggesting substantial non-use values.

5.2 Comparison Between National and Regional Value Results

Because of these concerns, it is of interest to gauge the correspondence between the regional and the national trade off values. Table 5-1 compares the results from the national water quality value question set with those from the regional question set. The first set of values shown below consists of the actual survey responses elicited, where people who get to one of the extreme corners of the decision tree are assigned the value equal to the tradeoff at the corner question. As a result, this approach produces lower valuation estimates, which are $23 for the regional and $25 for the national. Because these estimates understate extreme valuations, we address that issue with estimates from a censored regression. The results obtained from the predicted estimates using censored regressions for the log national and regional values yield higher national values than regional values, $39 for the national as compared to $31 for the regional estimates. The censored estimates are consistent with the observed median responses, with both measures about one third higher for the national referendum.

Table 5–1: Comparison of Unit National Water Quality Benefit Value to Regional

	N	Mean	Median	Std Error
National Censored Observed Value	2359	$24.82	$20	0.424
Regional Censored Observed Value	4033	$22.99	$15	0.368
Estimate Using Log (National Censored Regression)[5]	2359	$39.42	$18.21	0.155
Estimate Using Log (Regional Censored Regression)	4033	$31.00	$13.98	0.158

5.3 National Value Censored Regression Results

Table 5-2 shows the same censored regression equation that was used for the primary water quality value, but replacing it with the national water quality value. Regression results are very similar regardless of the dependent variable is regional choice or national referendum, and this similarity holds whether the regressions are censored or not.

All of the variables that were significant in the primary water quality value regression are still significant with the same signs. Additionally, non-black, non-white race variable has a significant negative effect in the censored regression, and the geographic indicator that the respondent lives in the western portion of the United States has a negative effect on national water quality value in the national regression.

[5] If a logged distribution has mean M and variance S, then the mean of the un-logged distribution is $e^{(M+S/2)}$. In this application we took M and S to be the conditional means and variances given the regression. See Train, 2003.

Table 5-2: Censored Regression Estimates for Log of Unit National Water Quality Benefit Value

Consistent Sample, Including survey collected demographic variables	Log (Dollar Value for 1% Better Water Quality)	
Variable	Parameter Estimate	Standard Error
Log (Income)	0.0428 **	0.0211
Years of education	0.0264 ***	0.0077
Age	0.0038 ***	0.0012
Environmental Organization Membership	0.2446 ***	0.0820
Visited a Lake or River, last 12 Months	0.1003 **	0.0414
Race: Black	-0.1036 *	0.0567
Race: Non-black, Non-white	-0.1467 *	0.0762
Hispanic	0.0234	0.0619
Gender: Female	0.0118	0.0372
Household Size	-0.0354 **	0.0145
Region: Northeast	0.0720	0.0577
Region: South	-0.0472	0.0529
Region: West	-0.1003 *	0.0577
State Lake Quality	0.0004	0.0007
Lake Acres per State Square Mile	0.0049 **	0.0021
INTERCEPT	1.9129 ***	0.2366
	N	R-square
	2359	
	(126 left censored)	0.0155
	(119 right censored)	

Notes: * significant at .10 level, ** significant at .05 level, *** significant at .01 level, all two-tailed tests.

5.4 Comparison Between National and Regional Values by Pooling Data

Another way to compare national and regional water quality values is to include both values in the same analysis. Thus, instead of separate models for national and regional value each producing an independent estimate, those values are pooled, and compared on the same demographic and survey terms. Since the national water quality survey question set was only included in the final three rounds of the survey, earlier data for region value are not included in this estimate. As Table 5-3 shows, this analysis shows the higher value for national improvements, reveals significant effects from the demographic variables seen in previous regressions, and provides insight about what demographic characteristics lead to value differences between nation and region. Respondents who visit lakes and rivers more often tend to have lower national value than other respondents, as do those who believe their region has better quality than the nation overall. Those who are members of environmental organizations also value national improvements less highly than others (This result is likely related to the fact that such members value regional improvements more highly. Note in Table 5-2 that such members do have significantly higher national values.), and this analysis demonstrated a significant regional effect for those who live in the West, showing a lower value for national improvement than other respondents.

Table 5-3: Censored Regression, Log of Unit Water Quality Benefit Values, Pooled Nation and Region

	Coefficient	Standard Error
Survey Information		
Question Set: Nation	0.2812 ***	0.0436
Log Base Water Quality Level	-0.4844 ***	0.1226
No Info Given, Base Water Quality	-0.0805	0.0623
Told National Average Water Quality	-0.0927 **	0.0426
Interaction, Told X Log Base Quality	-0.8838 ***	0.2451
Respondent Behavior		
Total Trips, last 12 Months	0.0160 ***	0.0038
Trips Outside of Region	0.0425 ***	0.0113
Believe Region Better than Nation	0.0834 ***	0.0329
Member of Environmental Organization(s)	0.3575 ***	0.0647
Describe the Respondent		
Log (Income)	0.0820 ***	0.0164
Years of Education	0.0303 ***	0.0060
Age	0.0034 ***	0.0009
Black	-0.0790*	0.0442
Female	-0.0198	0.0294
Hispanic	0.0888 *	0.0491
Household Size	-0.0342 ***	0.0113
Respondent's State of Residence		
Northeast	0.1006 **	0.0462
South	0.0042	0.0400
West	0.0827	0.1076
State River Quality	0.0011	0.0007
Lake Acres per sq. mile in State	0.0045 ***	0.0017
Percent Federal Owned Land in State	-0.0017	0.0023
Interactions with Nation		
x Total Trips, last 12 Months	-0.0171 **	0.0075
x Trips Outside of Region	-0.0176	0.0223
x Believe Region Better than Nation	-0.2047 ***	0.0644
x Member of Env. Organization(s)	-0.3815 ***	0.1282
x Northeast	0.0405	0.0909
x South	-0.0237	0.0789
x West	-0.4041 **	0.2038
x Percent Federal Owned Land in State	0.0077 *	0.0044
Intercept	2.7769 ***	0.0145
/sigma	1.0903	0.0115
	N	R- Square
	5760	0.0225
	(475 left-censored)	
	(393 right-censored)	

Notes: * significant at .10 level, ** significant at .05 level, *** significant at .01 level, all two-tailed tests.
All variables are zero-centered.

The estimates from the regression above show that national improvements are valued about $5 more, or 17% higher than regional improvements by respondents overall, as shown in the table below.

Table 5-4: Estimated National and Regional Values from Pooled Regression

Censored Regression Estimation	Regional Improvement Value	National Improvement Value
N	2,906	2,854
Mean	$29.22	$34.27
Standard Deviation	$11.26	$7.18
Median	$14.12	$17.61

In addition, these estimates show an interesting effect on national and regional values in regards to whether the respondent makes use of the recreational amenities of lakes and rivers. As the table below shows, respondents who visit lakes and rivers value their quality more highly, both locally and nationally. More interestingly, however, is the comparison between regional and national values depending on water use.

Overall, national improvements are valued 17% more than regional improvements. Users value national improvements only 12% more, while those who had no trips in the last year valued national improvements 32% more than regional improvements.

Table 5-5: Comparisons Between Users of Recreational Water Benefits and Non-Users from Pooled Regression

Censored Regression Estimation	Regional Improvement Value	National Improvement Value
Overall		
N	2,906	2,854
Mean	$29.22	$34.27
Standard Deviation	$11.26	$7.18
Some Number of Trips to Lakes or Rivers		
N	1,991	1,961
Mean	$31.64	$35.45
Standard Deviation	$12.13	$7.40
No Trips to Lakes or Rivers		
N	915	893
Mean	$23.95	$31.70
Standard Deviation	$6.48	$5.92

SECTION 6. INDIVIDUAL USES AND LAKES VS. RIVERS

Respondents consider three components of water quality. The percentage of water rated good can be independently affected by fishing, swimming, and environmental quality. These three are defined as:

Fishing:
A lake or river is good for fishing if eating fish caught in the lake or river will not make you sick. A lake or river is not good for fishing if eating fish caught in the lake or river could make you sick.

Swimming:
A lake or river is good for swimming if prolonged contact with the water in the lake or river will not make you sick. A lake or river is not good for swimming if prolonged contact with the water can make you sick.

Aquatic Environment:
The aquatic environment is good if the lake or river supports a healthy, balanced community of aquatic life, such as fish, plants, insects, and algae.

In the earlier tradeoff tasks, these three qualities were defined to move together. Thus a change from 40% to 60% water rated good implies that all three components improve together, with a 1% improvement in one tied to a 1% improvement in the other two. The present section eliminates this assumption by using a choice experiment to determine the tradeoffs between these three components of percent good.

6.1 Question Format

The choice experiment involves asking respondents to make six choices among groups of alternatives that differ in the degree to which different components are improved or made worse. For example, a typical choice is that summarized in Figure 6-A.

Figure 6-A: Representative Attribute Conjoint Decision

Imagine that the government is considering policies that would affect water quality nationwide for recreational uses. The policies could have either positive, negative, or no effects on water quality for the three uses described earlier. The policies have a benefit that primarily affects either lakes or rivers.

Which of the two policies below would you prefer?

	Policy 1	Policy 2
Change in:	Lakes	Rivers
Fishing	+ 5 %	0 %
Swimming	- 5 %	- 5 %
Aquatic Environment	0 %	+ 5 %
Which Policy would you prefer?	Policy 1 *	Policy 2 *

6.2 Individual Uses Results

In a given choice set each component is associated with one of three levels: a loss of 5%, no change, and a gain of 5%, affecting either lakes or rivers. Effectively, the respondent needs to trade off gains or losses in one component against gains or losses in the other. Across choice sets the assignment of levels to components varies in such a way that it is possible to estimate a linear model for each respondent. These models take the form of:

$$U_i = a*\text{Fishing} + b*\text{Swimming} + c*\text{Environment}$$

$$U_i = 0.1380*\text{Fishing} + 0.1173*\text{Swimming} + 0.1361*\text{Environment}$$

In effect, if we interpret these results in terms of a standard random utility model, what these models do is construct an overall utility index of water quality based on the subcomponents. The tradeoffs between different component dimensions of water quality are given by the ratios of their coefficients. What is important is the normalized values of these coefficients in terms of their relative weight. The estimates in this equation imply that one can replace the overall utility of the combination with a composite score comprised of 35.2% of the point gain or loss in quality from fishing, 30.0% from swimming, and 34.8% from the environment.[6] Suppose, for example that a program had a 5% loss from fishing, a 5% gain in swimming and a 5% gain from the environment. That would be equivalent to a ((-5%*0.352) + (5%*0.300) + (5%*0.348)) = 1.48% overall gain in percent good.

6.3 Lakes vs. Rivers Preference Results

Since the choice offered was split between an alternative that changes lakes and one that changes rivers, a preference level can be estimated between improvements to the different water bodies. Responses indicated that a weight of 53.1% is appropriate for gains to lakes compared with a weight of 46.9% for rivers.

Respondents were not told within the survey that overall national lake quality is lower than river quality according to the National Water Quality Inventory. If respondents were acting on their own experience about these quality differences, this trade-off preference for lakes may reflect the higher marginal value of improvements (see section 3.3B) to relatively worse-off lake quality. If not, the priority preference for lake improvements may be greater than reported above, since lake improvements have a higher marginal value than river improvements due to current quality differences.

[6] These results were obtained from an analysis of the final two rounds of the survey, where the question formats for this section were identical. If previous survey rounds are included (rounds 2, 3, and 4), which had slightly different question formats, the component values would be 33.68%(fishing), 30.36%(swimming), and 35.96%(environment).

SECTION 7. TIME DISCOUNTING

In this choice experiment, respondents were asked to make choices across three environmental policies that differed in terms of cost, water quality, and delay until the benefit will occur. This segment of the survey provides a rationality test of the responses in that immediate improvements should be preferred to deferred improvements of the same magnitude. These results also have important policy implications because they assess the value of changing an environmental problem now, compared with waiting. We will determine how much respondents were willing to trade off the amount of an improvement to get it a year sooner.

7.1 Time Discounting Question Format

A sample choice question is provided in Figure 7-A below.

Figure 7-A: Sample Timing of Improvement Question

Imagine again that you have recently moved to another region of the country, where water quality is 50% Good.

Imagine that the government is considering several policies that would temporarily increase water quality in your region. Once the policy is in effect, the improvement lasts for five years, then water quality returns to its previous level. Regardless of when the improvement begins, the cost of each begins immediately and continues for 5 years.

Which of the three policies below would you most prefer?

	Policy 1	Policy 2	Policy 3
Year When Improvement Begins	Now	2 Years From Now	6 Years From Now
Amount of Water Improvement	5%	10%	15%
Cost of Policy Per Year	$100	$200	$300
Which Region Would you Prefer?	Policy 1 *	Policy 2 *	Policy 3 *

The question is presented a total of 5 times, with the policies varying in terms of water quality improvement (5%, 10%, 15%, or 20%), the cost of the policy ($100, $200, $300, or $400), and timing of the improvement (Now, 2 Years From Now, 4 Years From Now, 6 years from now)

7.2 Time Discounting Results

Analysis of the results indicated that people had strong preferences for water quality improvements with fewer delays. Thus, the results passed an inter-temporal rationality test, consequently providing an additional validity test of the survey methodology and results.

Results from Table 7-1 suggest that the discount rate for water quality improvements declines from an annual 14.4% for a delay of 2 years, to 8.4% for a delay of 4 years, and 8.7% for a delay of 6 years.

Additionally, this question set provides a second opportunity to measure regional improvement values. In other regressions not reported here using a random utility model, the estimates imply a trade-off of $23 for each 1% of water quality improvement.

Table 7-1: Conditional Fixed Effects Logit Estimates of Discounting Policy Choice

	Did the Respondent Choose the Offered Policy	
Variable	Coefficient	Standard Error
Cost of Policy (per dollar/year)	-0.0053 ***	0.0001
Water Quality Improvement (per percent)	0.1483 ***	0.0036
Delay of Improvements (per year)	-0.1337 ***	0.0144
Delay (2 Years) X Improvement	-0.0348 ***	0.0031
Delay (4 Years) X Improvement	-0.0410 ***	0.0045
Delay (6 Years) X Improvement	-0.0583 ***	0.0061

Notes: *** significant at the .01 level, all two-tailed tests.

There are also significant demographic effects in the timing of improvements question set. As Table 7-2 shows, demographic interactions with the components of the questions showed several significant effects on whether the respondent chose the policy with certain components. Older respondents were less likely to choose policies with higher delays, as were Black respondents and respondents who had visited a lake or river in the past year. Visitors were also more likely to choose a policy with a higher improvement. Wealthier respondents were more likely to accept a higher cost policy, as were members of environmental organizations.

Table 7-2: Demographic Effects on Time Discounting Using Conditional Fixed Effects Logit

Panel A

Variable	Coefficient	(Std. Error)
Water Quality Improvement	0.0966 ***	(0.0045)
Delay	-0.2608 ***	(0.0053)
Cost	-0.0055 ***	(0.0001)
Delay 2 x Improvement	-0.0079	(0.0060)
Delay 4 x Improvement	-0.0312 ***	(0.0062)
Delay 6 x Improvement	-0.0517 ***	(0.0064)

Panel B

	Improvement Interactions	Delay Interactions	Cost Interactions	Delay 2 x Improvement Interactions	Delay 4 x Improvement Interactions	Delay 6 x Improvement Interactions
Age	-0.0005 *	-0.0024 ***	8.41e-6	-0.0007 **	-0.0004	0.0003
	(0.0003)	(0.0003)	(6.53e-6)	(0.0004)	(0.0004)	(0.0004)
Black	-0.0099	-0.0822 ***	0.0009 ***	0.0023	-0.0127	0.0571 ***
	(0.0134)	(0.0162)	(0.0003)	(0.0177)	(0.0188)	(0.0189)
Female	-0.0082	-0.0157	0.0005 **	-0.0034	-0.0137	0.0034
	(0.0090)	(0.0107)	(0.0002)	(0.0119)	(0.0124)	(0.0127)
Education	40.08e-6	-0.0013	-5.68e-5	-0.0024	-0.0062 **	-0.0029
	(0.0018)	(0.0021)	(4.4e-5)	(0.0024)	(0.0025)	(0.0025)
Income x 1000	-3.58e-5	0.0001	8.60e-6 ***	-0.0003	-3.5e-5	-0.0002
	(0.0001)	(0.0001)	(2.99e-6)	(0.0002)	(0.0002)	(0.0002)
Environment.Org	-0.0250	-0.0345	0.0012 **	-0.0303	-0.0369	-0.0549 *
	(0.0201)	(0.0245)	(0.0005)	(0.0265)	(0.0280)	(0.0289)
Visited Water	0.0570 ***	-0.0383 ***	0.0001	0.0239 *	0.0475 ***	0.0459 ***
	(0.0097)	(0.0116)	(0.0002)	(0.0130)	(0.0135)	(0.0139)
Lake Density	-0.0001	-0.0010 *	1.4e-5	-0.0004	-0.0005	-0.0002
	(0.0005)	(0.0006)	(1.2e-5)	(0.0006)	(0.0007)	(0.0007)

Notes: * significant at .10 level, ** significant at .05 level, *** significant at .01 level, all two-tailed tests. All variables are zero-centered

SECTION 8. APPLICATION OF RESULTS

8.1 Example One, Restoration of Water Quality to 1994 Levels from 2000 Levels

From 1994 to 2000, the EPA's National Water Quality Inventory reports that water quality in the nation's lakes and rivers fell for lakes from 63% in 1994 to 54% in 2000. It reports that for rivers, quality fell from 64% in 1994 to 61% in 2000.

According to our results, how much would it be worth to restore water quality to 1994 levels from a 2000 baseline?

Since we are discussing overall water quality, we will not need to split values into the separate uses, whose percentage shares were discussed in Section 6 (if improvements were different for each use, the improvement for each use would be multiplied by the weight proportion for that use, 0.352 for fishing, 0.300 for swimming, and 0.348 for aquatic environment).

Also, since the range of improvement is close to the mean surveyed starting quality of 55%, we will not adjust the value for staring point in this example, using the $31.00 estimate of water quality value.

Since the improvement levels are different for lakes and rivers, those values must be split as described in Section 6, with 53.1% for gains to lakes and a weight of 46.9% for rivers.

Therefore, for this example, the value would be:

(quality value) x (lake improvement) x (lake share)
+
(quality value) x (river improvement) x (river share)

or:

($31.00) x (9%) x (53.1%) + ($31.00) x (3%) x (46.9%)

The estimated value for this restoration to 1994 baseline water quality levels from 2000 levels would be about $192 per household per year. Since this is a national improvement, the value might be higher, reflecting the $39.42 value for national improvements, or about $244 per household per year.

According to the Statistical Abstract of the United States, there were about 111 million households in the United States in 2003. Using that number, the total annual value of the water quality restoration described in the example would be either $21 or $27 billion per year, depending on whether regional or national values were used.

8.2 Example Two, Improvement of Water Quality in a Region by 5%

For a more complicated example, consider a policy that would improve a region's lakes and rivers by five percentage points (let's say, from 62% good to 67% good). This example will recalculate the regression estimate from Table 3-4 using the characteristics of this hypothetical region.

For this example, the region has the following average demographic characteristics:

Income: $37,000 (10.52 logged)

Education: 13 years
Age: 45 years
Race, Black: 13%
Race, Non-Black, Non-White: 6%
Hispanic: 11%
Female: 50%
Household Size: 2.7
Region: Western United States
State Lake Quality: 62% Good (Washington State)
Lake Density in State: 7.00 Acres per Square Mile (Washington State)

If demographic characteristics are unknown, they should be set to national averages, or the average of the larger geographic region, as appropriate. For the non-census variables used in Table 3-4, our surveys showed that 5.4% of respondents were members of environmental organizations, and 67.4% had visited a lake or river in the last 12 months. This example will use those values.

The next step is to apply the demographic values to the coefficients from Table 3-4. This is done by multiplying each demographic value by its coefficient, then taking their sum.

Sum = Income + Education + Age + Membership + Visited + Black + Other + Hispanic + Female + Household + Northeast + South + West + State Quality + Lake Density + Intercept)

Sum = (10.52 * 0.1240) + (13 * 0.0392) + (45 * 0.0062) + (.054 * 0.5275) + (.674 * 0.1930) + (.13 * -0.1270) + (.06 * 0.0165) + (.11 * 0.1077) + (.50 * -0.0478) + (2.7 * -0.0294) + (0 * 0.0262) + (0 * -0.0400) + (1 * -0.0174) + (62 * 0.0004) + (7 * 0.0044) + (0.4332)

Sum = 2.616

Table 3-4 also includes coefficients to correct for anchoring, information, and reference point effects. The ideal of an informed citizenry would suggest that efficient improvement values should reflect information about national water quality (Told National = 1). Baseline quality is log(.62) as described above in the example (since quality is 62% good before the policy), and a starting tradeoff of log($14.20) should be used as described in section 4.2 to minimize anchoring. However, since these variables were zero-centered in the regression equation, Told should hold a value of 0.49, log(baseline quality) should be reduced by 0.6335, and starting tradeoff should hold a value of -0.0864.

Correction = Told National + Baseline Quality + (Told * Baseline) + Starting Tradeoff
Correction = (0.49 * -0.0396) + (.1554 * -0.4206) + (.0793 * -0.4617) + (-.0864 * .5251)
Correction = -0.1667

Total = Sum + Correction
Total = 2.45 ($11.59 un-logged)

This number reflects the log estimate from the regression equation, and approximates a median of the logged distribution. As discussed in footnote 3 in Section 5.2, this number should be adjusted in order to reflect the mean of the un-logged distribution. For Table 3-4, the factor of (variance/2) from footnote 3 has a value of 0.667. Including this adjustment leads to:

Value = $e^{(2.45 + 0.667)}$

Value = $22.57

Thus, for this example, each 1% of improvement has a mean value of $22.57 per year, per household of the region improved. Since improvement is the same for lakes and rivers, there is no need to break down the values as was done in section 8.1. Assuming that the region includes one million households, the total annual value of the improvement would be:

Total Value = $22.57 * 5% * 1 million households
Total Value = $113 million per year

8.2b Example 2, But With Low Starting Quality

Let us again consider the example in a region that has lower water quality, but is in all other ways identical to the example above. In this case, assume 35% water quality improved to 40%.

All the factors above remain the same, except for the correction value.

Correction = Told National + Baseline Quality + (Told * Baseline) + Starting Tradeoff
Correction = (0.49 * -0.0396) + (-.2828 * -0.4206) + (-.1386 * -0.4617) + (-.0864 * .5251)
Correction = 0.1182

Total = Sum + Correction
Total = 2.734 ($15.40 un-logged)

Value = $e^{(2.734 + 0.667)}$
Value = $30.00

Total Value = $30.00 * 5% * 1 million households
Total Value = $150 million per year

This example demonstrates the diminishing marginal utility for water quality improvements as water quality rises, suggesting that improvements to poor quality regions should have a higher priority.

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Appendix A: Knowledge Networks Methodology

Introduction

Knowledge Networks has recruited the first online research panel that is representative of the entire U.S. population. Panel members are randomly recruited by telephone and households are provided with access to the Internet and hardware if needed. Unlike other Internet research, which covers only individuals with Internet access who volunteer for research, Knowledge Networks surveys are based on a sampling frame which includes both listed and unlisted numbers, and is not limited to current Web users or computer owners.

Knowledge Networks selects households using random digit dialing (RDD). Once a person is recruited to the panel, they can be contacted by e-mail (instead of by phone or mail). This permits surveys to be fielded very quickly and economically. In addition, this approach reduces the burden placed on respondents, since e-mail notification is less obtrusive than telephone calls, and most respondents find answering Web questionnaires to be more interesting and engaging than being questioned by a telephone interviewer.

Panel Recruitment Methodology

Beginning recruitment in 1999, Knowledge Networks (KN) has established the first online research panel based on probability sampling that covers both the online and offline populations in the U.S. The panel members are randomly recruited by telephone and households are provided with access to the Internet and hardware if needed. Unlike other Internet research that covers only individuals with Internet access who volunteer for research, Knowledge Networks surveys are based on a sampling frame that includes both listed and unlisted phone numbers, and is not limited to current Web users or computer owners. Panelists are selected by chance to join the panel; unselected volunteers are not able to join the KN panel.

Knowledge Networks initially selects households using random digit dialing (RDD) sampling methodology. Once a household is contacted by phone and household members are recruited to the panel by obtaining their e-mail address or setting up e-mail addresses, panel members are sent surveys over the Internet using e-mail (instead of by phone or mail). This permits surveys to be fielded quickly and economically, and also facilitates longitudinal research. In addition, this approach reduces the burden placed on respondents, since e-mail notification is less obtrusive than telephone calls, and allows research subjects to participate in research when it is convenient for them.

Knowledge Networks' panel recruitment methodology uses the quality standards established by selected RDD surveys conducted for the Federal Government (such as the CDC-sponsored National Immunization Survey).

Knowledge Networks utilizes list-assisted RDD sampling techniques on the sample frame consisting of the entire United States residential telephone population. Knowledge Networks excludes only those banks of telephone numbers (consisting of 100 telephone numbers) that have zero directory-listed phone numbers. Two strata are defined using 2000 Census Decennial Census data that has been appended to all telephone exchanges. The first stratum has a higher concentration of Black and Hispanic households and the second stratum has a lower concentration relative to the national estimates. Knowledge Networks' telephone numbers are selected from the 1+ banks with equal probability of selection for each number within each of the 2 strata, with the Black and Hispanic strata being sampled at a higher rate than the other strata. Note that the sampling is done without replacement to ensure that numbers already fielded by Knowledge Networks do not get fielded again.

Telephone numbers for which Knowledge Networks is able to recover a valid postal address is about 70%. The telephone phone numbers for which an address is recovered are selected with certainty; between one-half and one-third of the remainder are sub-sampled randomly depending on the recruitment period. The resulting cost efficiency more than offsets the decrease in precision caused by the need for sample weights. The address-matched telephone numbers are sent an advance mailing informing them that they have been selected to participate in the Knowledge Networks panel.

Following the mailing, the telephone recruitment process begins for all sampled phone numbers. Cases sent to telephone interviewers are dialed up to 90 days, with at least 10 dial attempts on cases where no one answers the phone, and on phone numbers known to be associated with households. Extensive refusal conversion is also performed. Experienced interviewers conduct all recruitment interviews. The recruitment interview, which typically requires about 10 minutes, begins with the interviewer informing the household member that they have been selected to join the Knowledge Networks Panel. If the household does not have a PC and access to the Internet, they are told that in return for completing a short survey weekly, the household will be given a WebTV set-top box and free monthly Internet access. All members in the household are then enumerated, and some initial demographic variables and background information of prior computer and Internet usage are collected.

As of August 2002, those RDD households that inform interviewers that they have a home computer and Internet access have been recruited to the panel and asked to take their surveys using their own equipment and Internet connections. Points, which can be redeemed for cash at regular intervals, are given to respondents for completing their surveys and take the place of a free WebTV and monthly Internet access provided to other panel households. Additional incentive points may be added to specific surveys to improve response rates or to compensate for longer surveys.

Prior to shipment, each WebTV unit is custom configured with individual email accounts, so that it is ready for immediate use by the household. Most households are able to install the hardware without additional assistance, though Knowledge Networks maintains a telephone technical support line and will, when needed, provide on-site installation. The Knowledge Networks Call Center also contacts household members who do not respond to e-mail and attempts to restore contact and cooperation. PC panel members provide KN with their email account and their weekly surveys are sent to that email account.

All new WebTV panel members are sent an initial survey to confirm equipment installation and familiarize them with the WebTV unit. For all new panel members, demographics such as gender, age, race, income, and education are collected in a follow-up survey for each panel member to create a member profile. This information can be used to determine eligibility for specific studies and need not be gathered with each survey. Once this survey is completed, the panel member is regarded as active and ready to be sampled for other surveys. Parental or legal guardian consent is also collected for conducting surveys with teenagers age 13-17 as part of the first survey.

Weighting and Estimation

Whereas in principle the sample design is an equal probability design that is self-weighting, in fact there are several known deviations from this guiding principle. Furthermore, despite our efforts to correct for known sources of deviation from equal-probability design, there are several other sources of survey error that are an inherent part the process. We address these sources of survey error globally through the post-stratification weights, which we describe below.

Sample Design Weights

The seven sources of deviation from a proportional design are:

1. Half-sampling of telephone numbers for which we could not find an address,
2. RDD sampling rates proportional to the number of phone lines in the household,
3. Minor over-sampling of Chicago and Los Angeles due to early pilot surveys in those two cities,
4. Short-term double-sampling the four largest states (CA, NY, FL, and TX) and central region states,
5. Under-sampling of households not covered by MSN TV,
6. Over-sampling of minority households (Black and Hispanic),
7. Over-sampling of households with PC and Internet access,
8. Selection of one adult per household.

A few words about each feature:

1. Once the telephone numbers have been purged and screened, we address match as many of these numbers as possible. The success rate so far has been in the 70% range. The telephone numbers with addresses are sent a letter. The remaining, unmatched numbers are half-sampled in order to reduce costs. Based on previous research we suspect that the reduced field costs resulting from this allocation strategy will more than offset increases in the design effect due to the increased variance among the weights. We are currently quantifying these balancing features.

2. As part of the field data collection operation, we collect information on the number of separate phone lines in the selected households. We correspondingly down-weight households with multiple phone lines.

3. Two pilot surveys carried out in Chicago and Los Angeles increased the relative size of the sample from these two cities. The impact of this feature is disappearing as the panel grows.

4. Since we anticipated additional surveying in the four largest states, we double-sampled these states during January-October 2000. Similarly, the central region states were over-sampled for a brief period.

5. Certain areas of the U.S. are not serviced by MSN®. We select a smaller sample of phone numbers in those areas and use other Internet Service Providers for Internet access of recruited households in those areas.

6. As of October 2001, we began over-sampling minority households (Black and Hispanic) to increase panel capacity for those subgroups.

7. As of August 2002, we began over-sampling households with PCs and Internet access to reduce the cost of WebTV set-up and maintenance.

Finally, for most of our surveys, we select panel members across the board, regardless of household affiliation. For some surveys, however, we select members in two stages: households in the first stage and one adult per household in the second stage. We correct for this feature by multiplying the probabilities of selection by 1/ai where ai represents the number of adults (18 and over) in the household.

Appendix B: Survey Structure for Regional Benefit Values

Figure B-A: Sample Regional Water Quality Benefit Question

We would like to ask you some more questions like these. However, in these questions, one region will have a lower annual cost of living and the other will have higher water quality. **Remember that the national average for water quality is 65% Good.**

	Region 1	Region 2	
Increase in Annual Cost Of Living	**$100** More Expensive	**$300** More Expensive	
Percent of Lake Acres and River Miles With Good Water Quality	**40%** Good Water Quality	**60%** Good Water Quality	
Which Region Would you Prefer?	Region 1 *	Region 2 *	No Preference *

Sample and Version Splits:

All Rounds:
Half of respondents are shown the last sentence "Remember that the national average for water quality is 65% Good."
The other half of respondents are not shown the last sentence.

Round 1:

Starting ranges: Half of respondents get a 20% difference of water quality between regions and $200 cost difference between regions.
The other half of respondents get a 30% difference and $300 cost difference.

One third of respondents have a low starting point for Region 1 water quality (20%).
One third of respondents have a medium starting point for Region 1 water quality (40%).
One third of respondents have a high starting point for Region 1 water quality (60%).

Rounds 2 and 3:

Starting ranges: Half of respondents get $100/$300 for this question, and the other half of respondents get $100/$500.

Half of respondents get 40%/60% for this question, and the other half of respondents get 40%/80%.

Round 4:

Starting ranges: Half of respondents get $100/$500 for this question, and the other half of respondents get $100/$600.

Half of respondents get 50%/70% for this question, and the other half of respondents get 50%/75%

Base rates: Half of respondents get starting points for water quality that are 20 percentage points higher (either 70%/90% or 70%/95%).

Round 5:

Starting ranges: Cost and Improvement starting points are $100/$300 with 50%/60%, $100/$400 with 50%/60%, $100/$400 with 50%/65%, $100/$400 with 50%/70%, $100/$500 with 50%/65%, or $100/$500 with 50%/70%.

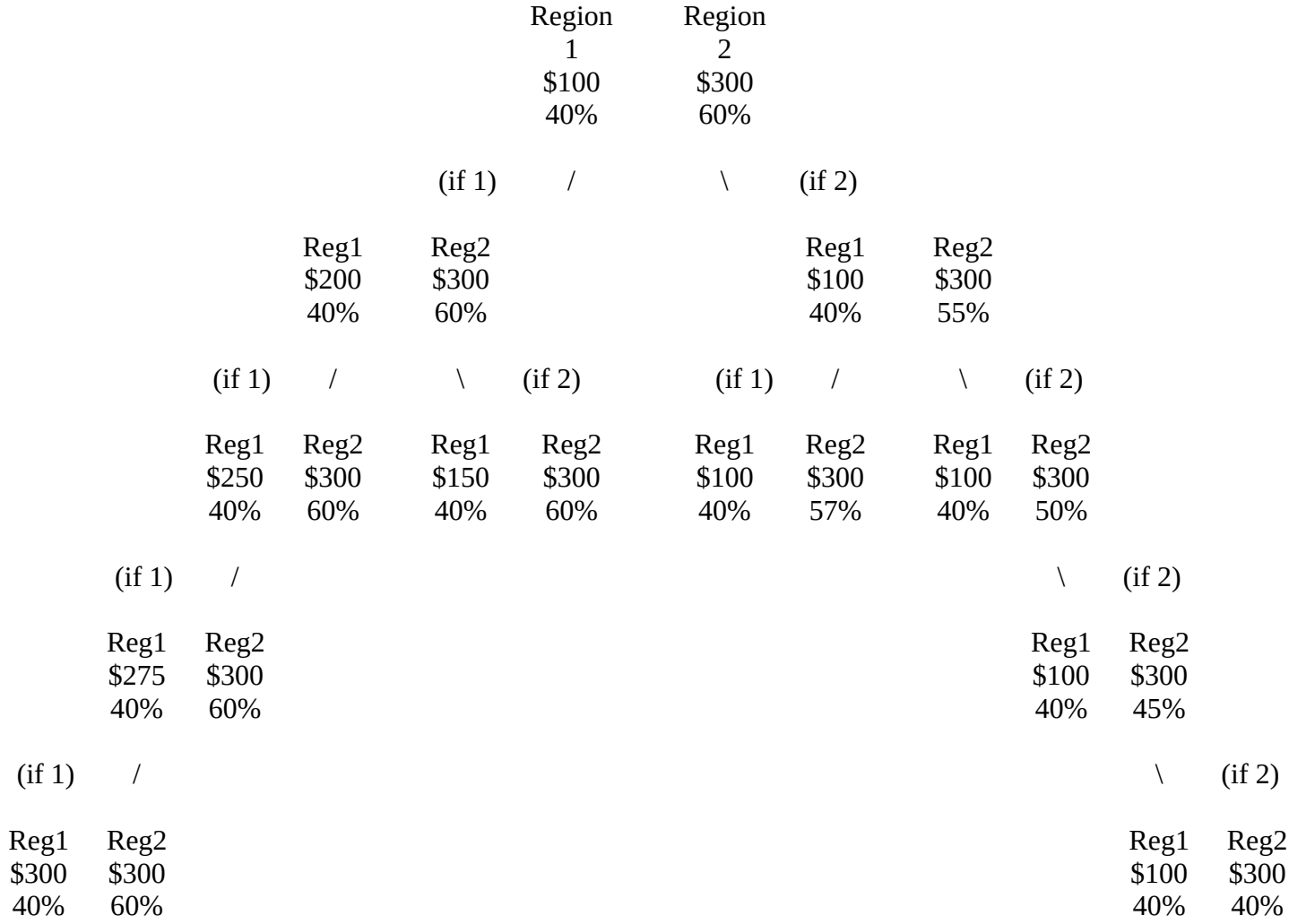
Base rates: Half of respondents get starting points for water quality that are 20 percentage points higher.

Round 6:

Starting ranges: Cost and Improvement starting points are $100/$300 with 50%/60%, $100/$400 with 50%/70%, $100/$500 with 50%/70%, and $100/$500 with 50%/75%.

Base rates: Half of respondents get starting points for water quality that are 20 percentage points higher.

Figure B-B: Survey Decision Tree



Appendix C: Heckman Correction

The Heckman analysis of our survey invitees is similar to the regression analysis, though, as Table C-1 shows, the analysis indicates a significant difference between those who participated and those who did not.

Table C-1: Heckman Analysis vs. OLS Regression Analysis of Log Unit Water Quality Benefit Values

Variable	Log (Dollar Value for 1% Better Water Quality) Heckman Analysis Parameter Estimate	Standard Error	Log (Dollar Value for 1% Better Water Quality) OLS Regression Parameter Estimate	Standard Error
Log (Income)	0.1046 ***	0.0193	0.1022 ***	0.0193
Years of education	0.0421 ***	0.0067	0.0404 ***	0.0067
Age	0.0064 ***	0.0010	0.0057 ***	0.0010
Race: Black	-0.2192 ***	0.0517	-0.1743 ***	0.0497
Race: Non-black, Non-white	-0.0077	0.0690	-0.0093	0.0691
Hispanic	0.0215	0.0565	0.0553	0.0552
Gender: Female	-0.0398	0.0329	-0.0356	0.0329
Household Size	-0.0382 ***	0.0135	-0.0255 **	0.0129
Region: Northeast	0.0100	0.0511	0.0157	0.0512
Region: South	-0.0582	0.0464	-0.0534	0.0465
Region: West	-0.0503	0.0507	-0.0421	0.0507
State Lake Quality	0.0004	0.0006	0.0004	0.0006
Lake Acres per State Square Mile	0.0035 **	0.0018	0.0034 *	0.0018
INTERCEPT	0.6787 ***	0.2190	0.8374 ***	0.2147
Select				
Stress Level	-0.1605 ***	0.0408		
Stress Data Missing	-0.9632 ***	0.0504		
Race: Black	-0.2624 ***	0.0497		
Hispanic	-0.2265 ***	0.0555		
Household Size	-0.0938 ***	0.0128		
INTERCEPT	1.1652 ***	0.0475		
/athrho	0.2915 ***	0.0856		
/lnsigma	0.0585 ***	0.0153		
Rho	0.2835	0.0787		
Sigma	1.0602	0.0162		
Lambda	0.3006	0.0867		

N	Wald chi2	Prob>chi 2	N	F-Value	R-square
5643	156.77	0.0000	4033	12.51	0.0358

LR test of indep.eqns. (rho=0): chi2(1)= 10.16 Prob>chi2= 0.0014

Notes: * significant at the .10 level, ** significant at the .05 level, *** significant at the .01 level, all two-tailed tests.

When the parameter estimates are compared between the Heckman analysis and a regression analysis of those who participated, the results look quite similar, including which demographic variables are significant and their signs.

If the parameter estimates for the demographic variables used in the analysis equations are applied to the characteristics of the respondents, the Heckman parameters result in a slightly lower value for water quality improvements, as shown in Table C-2.

Table C-2: Unit Water Quality Benefit Values Using Heckman and OLS Parameter Estimates

Estimate of Unit Water Quality Benefit Value	Mean	Median	Std Error (Mean)
Observed Log (Benefit Value)	2.630	2.708	0.0167
Regression Estimate of Log (Benefit Value)	2.630	2.639	0.0003
Heckman Estimate of Log (Benefit Value)	2.501	2.511	0.0036
Observed Benefit Value	$22.98	$15	0.3669
Regression Estimate of Benefit Value	$30.01	$14.00	0.0981
Heckman Estimate of Benefit Value	$26.51	$12.31	0.0956

Appendix D: Hierarchical Bayes Methodology

Choice experiments and hierarchical Bayes estimation:

This section reviews the use of choice-based conjoint as a mechanism to provide more detail on valuations to improvements in water quality. The initial iterative choice questions permit the estimation of each individual's trade off between cost of living and better water quality. Choice-based conjoint produces the same kind of result but has the advantage of estimating each person's trade-off's across multiple attributes. (Allenby and Ginter 1999). For example, below it generates an estimate of the relative value of three different components of good water quality—goodness for fish, swimming or aquatic environment.

Choice-based conjoint requires respondents to make a series of choices from different choice sets (Louviere, Hensher and Swait 2000). From these one could generate an aggregate logistic model predicting choice share as a function of the characteristics of the alternatives in each set. However, this aggregate model will be biased if there is heterogeneity in individual values. The solution is to specify a model that accommodates differences in parameters across respondents (Allenby and Rossi 1999, McFadden and Train 2000). This derived aggregate distribution of parameters can then be used as a way to make individual estimates of parameters more precise. Essentially, Bayes law is used to estimate a posterior distribution of an individual's parameters given the aggregate distribution and that individual's particular choices. This process was initially developed using Gibbs sampling methodology within the construct of a hierarchical Bayes model (Lenk, DeSarbo, Green and Young 1996), and is now readily available (Sawtooth Software 1999). While Bayesian methodology was used originally, it can be shown that the same results can derive from a maximum likelihood mixed logit model that derives individual values as a draw from the estimated aggregate distribution conditioned by the individual's choices (Huber and Train 2001).

Allenby, Greg M., and Peter E. Rossi (1999), "Marketing Models of Customer Heterogeneity," *Journal of Econometrics*, 89(1-2), 57-78.

Allenby, Greg M. and James L. Ginter (1996), "Using Extremes to Design Products and Segment Markets," *Journal of Marketing Research,* 32, 392-403.

Huber, Joel and Kenneth Train (2001) "On the Similarity of Classical and Bayesian Estimates of Individual Mean Partworths," *Marketing Letters*, 12:3, 259-269.

Lenk, Peter J., Wayne S. DeSarbo, Paul E. Green, and Martin R. Young (1996), "Hierarchical Bayes Conjoint Analysis: Recovery of Partworth Heterogeneity from Reduced Experimental Designs," *Marketing Science*, Vol. 15, No. 2, 173-91.

Louviere, Jordan L., David A. Hensher and J.D. Swait (2000) *Stated Choice Methods: Analysis and Applications.* Cambridge University Press, Cambridge UK.

McFadden, Daniel L., and Kenneth E. Train, (2003), "Mixed MNL Models for Discrete Response," *Journal of Applied Econometrics*.

Sawtooth Software Inc. (1999), "The CBC/HB Module for Hierarchical Bayes Estimation," at Sawtooth Software's website, www. Sawtoothsoftware.com.

Appendix E: Survey Variables Used in Analyses

Variable	N	Mean	Std.Dev	Min.	Max.
Consistent Sample Statistics					
Regional Water Quality Value	4033	29.2305	40.8688	0.3125	300
Log (Regional Water Quality Value)	4033	2.6333	1.2811	-1.1632	5.7038
Censored Regional Water Quality Value	4033	22.9934	23.3387	0.625	150
Log (Censored Regional Water Quality Value)	4033	2.6300	1.0624	-0.4700	5.0106
Regional Value Censored Low	4033	0.0932	0.2908	0	1
Regional Value Censored High	4033	0.0999	0.2999	0	1
Log (Income)	4033	10.5307	0.8923	7.8238	12.0725
Years of education	4033	13.1775	2.5619	8	21
Age	4033	44.6526	16.9921	18	98
Environmental Organization Membership	4033	0.0538	0.2257	0	1
Visited a Lake or River, last 12 Months	4033	0.6737	0.4689	0	1
Race: Black	4033	0.1322	0.3387	0	1
Race: Non-black, Non-white	4033	0.0630	0.2430	0	1
Hispanic	4033	0.1034	0.3045	0	1
Gender: Female	4033	0.4942	0.5000	0	1
Household Size	4033	2.6868	1.3846	1	11
Region: Northeast	4033	0.1855	0.3887	0	1
Region: South	4033	0.3623	0.4807	0	1
Region: West	4033	0.2125	0.4091	0	1
State Lake Quality	4033	50.2740	27.6141	0	100
Lake Acres per State Square Mile	4033	11.3924	9.5598	0.3375	41.3244
Log (Base Water Quality Level)	4033	3.9717	0.2512	2.9957	4.2485
Respondent Told National Quality Level	4033	0.5086	0.5000	0	1
Told X Log (Base Quality)	4033	2.0207	1.9947	0	4.2485
Log (Starting Water Quality Tradeoff)	4033	2.7606	0.3639	1.6094	3.4012
Respondent Told National Quality Level (zero-centered)	4033	-0.0014	0.5000	-0.51	0.49
Log (Base Water Quality Level) (zero-centered)	4033	.0000	0.2512	-0.9760	0.2768
Told X Log (Base Quality) (zero-centered)	4033	0.0009	0.1256	-0.4782	0.4977
Log (Starting Water Quality Tradeoff) (zero-centered)	4033	0.0006	0.3639	-1.1506	0.6412
Subject Stop and Continue Survey Later	4033	0.0776	0.2676	0	1
Time as Panel Member, in Months	4033	23.9038	17.5664	0	62
Days from Invitation to Completion	4033	4.9618	8.2628	0	83

Variable	N	Mean	Std.Dev	Min.	Max.
Invitee Sample Statistics					
Did Invitee Complete the Survey	5639	0.7530	0.4313	0	1
Inconsistent Respondent	5639	0.0369	0.1885	0	1
Log (Income)	5639	10.5069	0.9231	7.8238	12.0725
Years of education	5639	13.0830	2.5657	8	21
Age	5639	42.8888	16.8533	18	98
Race: Black	5639	0.1513	0.3583416	0	1
Race: Non-black, Non-white	5639	0.0667	0.2495	0	1
Hispanic	5639	0.1162	0.3204	0	1
Gender: Female	5639	0.4939	0.5000	0	1
Household Size	5639	2.7980	1.4174	1	11
Region: Northeast	5639	0.1853	0.3886	0	1
Region: South	5639	0.3671	0.4821	0	1
Region: West	5639	0.2167	0.4120	0	1
Currently Employed	5639	0.6297	0.4829	0	1
Not living in 150 largest MSA's	5639	0.1718	0.3773	0	1
Home Owner	5639	0.6226	0.4848	0	1
Married	5639	0.5460	0.4979	0	1
Dual Income Household	5639	0.5148	0.4998	0	1
Head of Household	5639	0.7789	0.4151	0	1
Time as Panel Member, in Months	5639	22.2268	17.5022	0	62
Stress Level	5639	0.4295	0.4950	0	1
Stress Data Missing	5639	0.1717	0.3771	0	1
Respondent Retired from KN Panel	5639	0.2800	0.4490	0	1

Variable	N	Mean	Std.Dev	Min.	Max.
Rounds 5 and 6 Consistent Sample Statistics (National Referendum Analysis)					
National Water Quality Value	2359	28.7197	34.9893	0.95	300
Log (National Water Quality Value)	2359	2.8998	0.9975	-0.0513	5.7038
Censored National Water Quality Value	2359	24.8214	20.5746	1.9	150
Log (Censored National Water Quality Value)	2359	2.9042	0.8282	0.6419	5.0106
Log (Income)	2359	10.5126	0.9276	7.8238	12.0725
Years of education	2359	13.1462	2.5478	8	21
Age	2359	44.6316	16.9322	18	98
Environmental Organization Membership	2359	0.0555	0.2291	0	1
Visited a Lake or River, last 12 Months	2359	0.6905	0.4624	0	1
Race: Black	2359	0.1344	0.3411	0	1
Race: Non-black, Non-white	2359	0.0670	0.2500	0	1
Hispanic	2359	0.1051	0.3068	0	1

Gender: Female	2359	0.4934	0.5001	0	1
Household Size	2359	2.6401	1.3887	1	11
Region: Northeast	2359	0.1925	0.3943	0	1
Region: South	2359	0.3616	0.4806	0	1
Region: West	2359	0.21238	0.4091	0	1
State Lake Quality	2359	49.9398	27.5438	0	100
Lake Acres per State Square Mile	2359	11.0744	9.1337	0.3375	41.3244
Regional Value Censored Low	2359	0.1094	0.3122	0	1
Regional Value Censored High	2359	0.0937	0.2914	0	1

Appendix F: Final Survey Text

*--
Welcome to our survey on the value of water quality.
This survey was put together by researchers at Harvard
and Duke Universities to help the government
understand your views on the value of water quality in
the lakes and rivers of your region. We hope that you will
find this survey interesting. Thanks very much for your responses.

For most of the questions in this survey, there are no right
or wrong answers. We are simply interested in your opinions.

*--
locale
*--
Which of the following best describes where you live now?

Select one answer only

* City
* Suburbs
* Small Town
* Country

How many members of your family (spouse, children, parents, or
other relatives) currently live in your home, including yourself?

Select one answer only

* One
* Two
* Three
* Four
* Five
* Six or more

*--
fam2a **(Only asked if fam1=1)**
*--
For the rest of this survey, when a question refers to your
family or members of your family who live in your home, think
of it as referring only to you.
*--
fam2b **(Only asked if fam1>1)**
*--
For the rest of this survey, when a question refers to you,
think of it as referring to you and the members of your

family who currently live in your home.

*--
use0
*--
In this survey we will ask you questions about how you value lakes and rivers. The questions we ask will only deal with fresh water bodies. Oceans or other salt water will not be included.

When we say lake in this survey, we mean any standing body of fresh water, including natural lakes, ponds, and reservoirs created by damming rivers. A lake in your region is any lake within 100 miles of your home, that is, within a 2-hour drive or so.

When we say river in this survey, we mean any flowing body of water fed by runoff from rain or snow. This includes rivers, creeks, and any other streams. A river in your region is any river within 100 miles of your home, that is, within a 2-hour drive or so.

Now we would like to ask you some questions about how you use lakes and rivers in your region.

*--
use1a
*--
Lake and River Use Questions

Have you (including family members who live in your home) visited a lake or river the last 12 months, in your region or elsewhere?

Select one answer only

* Yes
* No

*--
If use1a=2 then this next section is skipped, all the way to use1c
*--
usetrip
*--
How many times have you visited a lake or river in the last 12 months?

Select one answer only

* 1 or 2 trips
* 3 to 5 trips
* 6 to 9 trips

* 10 or more trips

How many of these visits have been to lakes or rivers outside of your region (more than 2 hours drive from your home)?

Select one answer only

* 0 visits to lakes or rivers outside my region
* 1 visit to lakes or rivers outside my region
* 2 visits to lakes or rivers outside my region
* 3 visits to lakes or rivers outside my region
* 4 or more visits to lakes or rivers outside my region

*----------
use1b1
*----------
Which of the following have you (including family members who live in your home) done in the last 12 months while visiting a lake or river?

Select all answers that apply

* Fishing

* Swimming

* Hunting

* Hiking

* Camping

* Boating or rafting

* Picnicking

* Wildlife observation

* None of these
*----------
use1c
*----------
How often in the last 12 months have you noticed a view of a lake or river?

Select one answer only

* Never

* Rarely
* Sometimes
* Often

*---
ufish **(Only if use1b1=1)**
*---
How many times in the last 12 months have you been fishing at a lake or river?

Select one answer only

* One time
* Two times
* Three times
* Four times
* Five or more times
* Not Sure

When you catch fish in a lake or river, how often do you eat the fish that are large enough to eat?

Select one answer only

* Never
* Sometimes
* Often
* Always

*---
uswim **(Only if use1b2=1)**
*---
How many times in the last 12 months have you been swimming in a lake or river?

Select one answer only

* One time
* Two times
* Three times
* Four times
* Five or more times
* Not Sure

*---
imagine
*---
Many of the following questions will ask you to imagine that you (including family members who live in your home) are planning

to move to another region.
The regions where you might move differ from the one where you now live in only two ways:

* The cost of living in the region, and

* The quality of water in the region.

In all other ways, they are much like where you live now.
For example, the regions have the same number of lakes and rivers as where you live now.

*----------
imag2
*----------
To help you answer the next questions, please read the following information on what we mean by "Cost of Living" and "Water Quality"

Cost of Living

For purposes of this survey, the cost of living is defined as the amount of money that your family spends each year for things like food, clothing, taxes, and rent or mortgage.
When we say that a region has a higher cost of living, we mean that each year you would have to spend more for these items overall.

*----------
col0
*----------
How concerned would you be if your family's cost of living went up $200 per year? (This would mean that items like food, clothing, taxes, and rent or mortgage would cost a total of $200 more each year than they do now.) This might mean an increase of $2 per week for food (or $104 per year) and $8 per month more for housing (or another $96 per year).

Select one answer only

* Not at all concerned
* A little concerned
* Somewhat concerned
* Very concerned

*----------
col1

Subjects will be split into four groups for these questions.
Group 1: $100/$300 cost, 10% improvement difference
Group 2: $100/$400 cost, 20% improvement difference
Group 3: $100/$500 cost, 20% improvement difference
Group 4: $100/$500 cost, 25% improvement difference

*--
Please answer the following practice question to make sure we explained Cost of Living clearly.

Imagine that you must move to another region of the country. You have narrowed your choices down to two. Both regions have a higher cost of living than where you live now, but are alike in all other ways.

	Region 1	Region 2	
Increase In Annual Cost of Living	**$100** More Expensive	**$500** More Expensive	
Which Region would you prefer	Region 1 *	Region 2 *	No Preference *

*--
bad1 **(Only if col1=2)**
*--
The question was not clear.

You chose to move to the region with a higher cost of living. You could have chosen a region with a lower cost of living that is alike in all other ways.

Are you sure that you want to move to the region with a higher cost of living?

Select one answer only

* Yes, I'm sure that I want to move to the region with higher cost of living.
* No, I'm not sure. Ask the cost of living question again.

*--
good1 **(Only if col1=1)**
*--
The Region you chose, Region 1, has a lower annual cost of living than Region 2.

Now we would like to explain what we mean by water quality.
*--
bad2 **(only if col1=3)**
*--
You indicated that you have no preference between two regions

whose only difference is that it is more expensive to live in one of them.

Are you sure that you don't care whether you would move to a region where it is more expensive to live? After all, you could move to a region with a lower cost of living that is alike in all other ways.

Select one answer only

* Yes, I'm sure that I have no preference.
* No, I'm not sure. Ask the cost of living question again.

*----------
defwat0
*----------

Water Quality

Some of the following questions will ask you to choose between regions that differ in terms of the quality of the water in either lakes or rivers in the regions.
The government rates water quality as either

* Good or
* Not Good.

Water quality is Good if the water in a lake or river is safe for all uses.
Water quality is Not Good if a lake or river is polluted or unsafe to use.

*----------
defwat1
*----------

More specifically,

Water quality is Good if the lake or river

* Is a safe place to swim,
* Fish in it are safe to eat, and
* Supports many plants, fish, and other aquatic life.

Water quality is Not Good if the lake or river

* Is an unsafe place to swim due to pollution,
* Has fish that are unsafe to eat, or
* Supports only a small number of plants, fish and other aquatic life.

*--
defwat1a
*--
These properties of water quality involve visiting a lake or river and are affected by the level of pollution.

This survey will not ask you about drinking water. Although drinking water can come from lakes or rivers, it is treated by water treatment plants to ensure safety.
*--
defwat2
*--
We will talk about water quality for more than one lake or river. The questions will include all the lakes or rivers in the region. This means all lakes and rivers within a 2-hour drive or so of your home, in other words, within 100 miles.

The entire country could be split into about 100 regions of this size.

We define the quality of the water in the lakes and rivers of a region by the percent of the total acres of lakes or miles of rivers in the region which have good water quality.

For example, let's say a region has several rivers, running a total of 100 miles in the region.

If pollution causes 50 of those miles to have water quality that is not good, leaving 50 miles with good water quality, then we would call the water quality for rivers in that region 50% good.

If for some reason, 10 miles were improved from not good to good, we would call the water quality for rivers in that region 60% good, an improvement of 10 percentage points. Any improvement in water quality will refer to these percentage point increases.
*--
defwat3b
ALL SUBJECTS ARE ASKED THIS QUESTION, BUT ONLY HALF GET THE NATIONAL INFORMATION. FOR OTHER HALF, REMOVE FIRST SENTENCE, AND REPLACE 65% GOOD IN ANSWER CHOICES WITH "THE NATION OVERALL"
*--
In the United States, the overall level of water quality for lakes and rivers is 65% Good.
What would you believe about the quality of lakes and rivers in your region?

Select one answer only

* Water Quality in my region is Worse than 65% Good.
* Water Quality in my region is About the Same as the Nation Overall.
* Water Quality in my region is Better than 65% Good.

*--
defwat4

Subjects will be split into four groups for these questions.
Group 1: $100/$300 cost, 10% improvement difference
Group 2: $100/$400 cost, 20% improvement difference
Group 3: $100/$500 cost, 20% improvement difference
Group 4: $100/$500 cost, 25% improvement difference

Half of subjects get 50% starting point for Region 1 and (50% + improvement difference as described above) for Region 2
Half of subjects get 70% starting point for Region 1 and (70% + improvement difference as described above) for Region 2

*--
Now try answering the following practice question about water quality. Imagine again that you must move to another region of the country. You have narrowed your choices down to two regions. They differ in only one way, the quality of the water in the regions. They even have the same number of acres of lakes and miles of rivers within 2 hours or so of where you would live.

	Region 1	Region 2
Percent of Lake Acres and River Miles With Good Water Quality	**50%**	**75%**

Which Region would you prefer	Region 1	Region 2	No Preference
	*	*	*

*--
bad3 **(Only if defwat4=1)**
*--
The question was not clear.

You chose to move to the region with worse water quality.

You could have chosen a region with better water quality that is alike in all other ways.

Are you sure that you want to move to the region with worse water quality?

Select one answer only

* Yes, I'm sure that I want to move to the region with worse water quality.
* No, I'm not sure. Ask the water quality question again.

*----------
good3 **(Only if defwat4=2)**
*----------
The Region you chose, Region 2, has better water quality than Region 1.

Next will be a sample question that combines water quality and cost of living.
*----------
bad4 **(Only if defwat4=3)**
*----------
You indicated that you have no preference between two regions whose only difference is that one has better water quality than the other.

Are you sure that you don't care whether you would move to a region where a lower proportion of lakes and rivers are safe and clean when you could move to a region with more rivers that are safe and clean that is alike in all other ways?

Select one answer only

* Yes, I'm sure that I have no preference
* No, I'm not sure, ask the water quality question again

*----------
colrem
*----------
We would like to ask you one more sample question to make sure we explained both cost of living and water quality clearly.

Remember, the cost of living is the amount of money that your family spends each year for things like food, clothing, and rent or mortgage.

Also remember that water quality in a region is the percent of the total acres of lakes and miles of rivers in the region which

are safe for swimming, fishing, and have a healthy environment.

*--
lask
*--
Subjects will be split into four groups for these questions.
Group 1: $100/$300 cost, 10% improvement difference
Group 2: $100/$400 cost, 20% improvement difference
Group 3: $100/$500 cost, 20% improvement difference
Group 4: $100/$500 cost, 25% improvement difference

Half of subjects get 50% starting point for Region 1 and (50% + improvement difference as described above) for Region 2
Half of subjects get 70% starting point for Region 1 and (70% + improvement difference as described above) for Region 2

*--
Cost of Living and Water Quality Question

This practice question combines the two ideas explained earlier. Remember that these regions are the same in all other ways, including the number of lakes and rivers near your home.

	Region 1	Region 2
Increase in Annual Cost Of Living	$500 More Expensive	$100 More Expensive
Percent of Lake Acres and River Miles With Good Water Quality	50%	75%

Which Region would you prefer	Region 1	Region 2	No Preference
	*	*	*

*--
lbad **(Only if lask=1)**
*--
The question was not clear.

You chose to move to the region with worse water quality and a higher cost of living.

You could have chosen a region with better water quality and a lower cost of living that is alike in all other ways.

Are you sure that you want to move to a region with worse water

quality and a higher cost of living?

Select one answer only

* Yes, I'm sure that I want to move to a region with worse water quality and higher cost of living
* No, I'm not sure, ask the question again.

*--
lgood **(Only if lask=2)**
*--
The Region you chose, Region 2, has better water quality and a lower annual cost of living than Region 1.

Now we would like to ask some more questions like these, but whose answers depend more on how you value water quality and cost of living differences.
*--
lbad2 **(Only if lask=3)**
*--
You indicated that you have no preference between two regions whose only difference is that one has a lower cost of living and better water quality than the other.

Are you sure that you don't care whether you would move to a region where it is more expensive to live and where a lower proportion of lakes and rivers are safe and clean? After all, you could move to a region with a lower cost of living and where more lakes and rivers are clean that is alike in all other ways.

Select one answer only

* Yes, I'm sure that I have no preference.
* No, I'm not sure, ask the question again.

*--
aska
*--
(Last sentence only shown if subjects are asked defwat3b)

Subjects will be split into four groups for these questions.
Group 1: $100/$300 cost, 10% improvement difference
Group 2: $100/$400 cost, 20% improvement difference
Group 3: $100/$500 cost, 20% improvement difference
Group 4: $100/$500 cost, 25% improvement difference

Half of subjects get 50% starting point for Region 1 and (50% + improvement difference as described above) for Region 2
Half of subjects get 70% starting point for Region 1 and (70% + improvement difference as described above) for Region 2

Half of subjects see the questions as shown here, where the chosen region gets worse in iterated questions.
Half of subjects see questions where the non-chosen region improves in iterated questions (for instance, in ASKB, region 1 would have $100 and region 2 would have $300, preserving the cost of living difference between regions while leaving the chosen region as it was) (similarly, in ASKC, region 1 would have 55% and region 2 would have 70%)

*---

We would like to ask you some more questions like these. However, in these questions, one region will have a lower annual cost of living and the other will have higher water quality. **Remember that the national average for water quality is 65% Good.**

	Region 1	Region 2	
Increase in Annual Cost Of Living	**$100** More Expensive	**$500** More Expensive	
Percent of Lake Acres and River Miles With Good Water Quality	**50%** Good Water Quality	**75%** Good Water Quality	
Which Region would you prefer	Region 1 *	Region 2 *	No Preference *

*---

AskX (Only if AskA=No Preference)

*---

You have indicated that you have no preference between the two regions.

Please briefly explain why you have no preference.

*---

askb **(Only if aska=1)**

*---

Would your choice change if the alternatives were slightly different? What if Region 1, the region with a lower cost of living, had an annual cost of living $300 higher instead of $100 higher.

	Region 1	Region 2

Increase in Annual Cost Of Living	$100 $300	Old	$500	
Percent of Lake Acres and River Miles With Good Water Quality	50%		75%	
Which Region would you prefer	Region 1 *		Region 2 *	No Preference *

*----------

(If askb=3 then the survey skips to next section)

*----------

askc **(Only if aska=2)**

*----------

Would your choice change if the alternatives were slightly different? What if Region 2, the region with better water quality, had 70% of lake acres and river miles with good water quality instead of 75% of lake acres and river miles with good water quality?

	Region 1		Region 2	
Increase in Annual Cost Of Living	$100		$500	
Percent of Lake Acres and River Miles With Good Water Quality	50%		75% 70%	Old
Which Region would you prefer	Region 1 *		Region 2 *	No Preference *

*----------

(If askc=3 then the survey skips to next section)

*----------

askd **(Only if askb=1)**

*----------

What if Region 1, the region with a lower cost of living, had an annual cost of living $400 higher instead of $300 higher.

	Region 1		Region 2	
Increase in Annual Cost Of Living	$100 $300 $400	Old Old	$500	

Percent of Lake Acres and River Miles With Good Water Quality	50%	75%

Which Region would you prefer	Region 1 *	Region 2 *	No Preference *

*----------

(If askd=3 then the survey skips to next section)

*----------

aske **(Only if askb=2)**

*----------

What if Region 1, the region with a lower cost of living, had an annual cost of living $200 higher instead of $300 higher.

	Region 1		Region 2
Increase in Annual Cost Of Living	$100 $300 $200	Old Old	$500

Percent of Lake Acres and River Miles With Good Water Quality	50%	75%

Which Region would you prefer	Region 1 *	Region 2 *	No Preference *

*----------

(If aske=3 then the survey skips to next section)

*----------

askf **(Only if askc=1)**

*----------

What if Region 2, the region with better water quality, had 73% of lake acres and river miles with good water quality instead of 70% of lake acres and river miles with good water quality?

	Region 1		Region 2
Increase in Annual Cost Of Living	$100		$500
Percent of Lake Acres and River Miles With Good	50%		75% 70% 73%	Old Old

Water Quality

Which Region would you prefer	Region 1 *	Region 2 *	No Preference *

*----------
(If askf=3 then the survey skips to next section)
*----------
askg **(Only if askc=2)**
*----------
What if Region 2, the region with better water quality, had 65% of lake acres and river miles with good water quality instead of 70% of lake acres and river miles with good water quality?

	Region 1	Region 2
Increase in Annual Cost Of Living	$100	$500
Percent of Lake Acres and River Miles With Good Water Quality	50%	75% Old 70% Old 65%

Which Region would you prefer	Region 1 *	Region 2 *	No Preference *

*----------
(If askg=3 then the survey skips to next section)
*----------
askh **(Only if askd=1)**
*----------
What if Region 1, the region with a lower cost of living, had an annual cost of living $450 higher instead of $400 higher.

	Region 1	Region 2
Increase in Annual Cost Of Living	$100 Old $300 Old $400 Old $450	$500
Percent of Lake Acres and River Miles With Good Water Quality	50%	75%

Which Region	Region 1	Region 2	No Preference

would you prefer * * *

*----------
(If askh=3 then the survey skips to next section)
*----------
aski **(Only if askh=1)**
*----------
What if Region 1, the region with a lower cost of living, had an annual cost of living $500 higher instead of $450 higher.

	Region 1	Region 2
Increase in Annual Cost Of Living	$100 Old $300 Old $400 Old $450 Old $500	$500
Percent of Lake Acres and River Miles With Good Water Quality	50%	75%

Which Region would you prefer	Region 1	Region 2	No Preference
	*	*	*

*----------
aibad1 **(Only if aski=1)**
*----------
You chose to move to the region with worse water quality.

You could have chosen a region with better water quality that is alike in all other ways.

Are you sure you would prefer a region with worse water quality when you could move to a region with better water quality?

Select one answer only

* Yes, I'm sure that I prefer the region with worse water quality
* No, I'm not sure, ask the question again

*----------
aibad1x **(Only if aibad1 = 1)**
*----------

Why did you choose the region with worse water quality?

Select one answer only

* I do not visit lakes or rivers, so I do not care about their quality.
* I do not believe that the region with better water quality would actually have the same cost of living.
* Another reason, not listed here.
* That was not the answer I intended, I would like to see the question again.

*----------

aibad3 **(Only if ask1=3)**

*----------

You indicated that you have no preference between two regions whose only difference is that one has better water quality than the other.

Are you sure that you don't care whether you would move to a region where a lower proportion of lakes and rivers are safe and clean when you could move to a region with more rivers that are safe and clean that is alike in all other ways?

Select one answer only

* Yes, I'm sure that I have no preference
* No, I'm not sure, ask the question again

*----------

aibad3x **(Only if aibad3 = 1)**

*----------

Why do you have no preference between regions with different levels of water quality?

Select one answer only

* I do not visit lakes or rivers, so I do not care about their quality.
* I do not believe that the region with better water quality would actually have the same cost of living.
* Another reason, not listed here.
* That was not the answer I intended, I would like to see the question again.

*----------

askk **(Only if askg=2)**

*----------

What if Region 2, the region with better water quality, had 57% of lake acres and river miles with good water quality instead of 65% of lake acres and river miles with good water quality?

	Region 1	Region 2	
Increase in Annual Cost Of Living	$100	$500	
Percent of Lake Acres and River Miles With Good Water Quality	50%	75% 70% 65% 57%	Old Old Old

Which Region would you prefer	Region 1	Region 2	No Preference
	*	*	*

*----------

askj **(Only if askk=2)**

*----------

What if Region 2, the region with better water quality, had 50% of lake acres and river miles with good water quality instead of 57% of lake acres and river miles with good water quality?

	Region 1	Region 2	
Increase in Annual Cost Of Living	$100	$500	
Percent of Lake Acres and River Miles With Good Water Quality	50%	75% 70% 65% 57% 50%	Old Old Old Old

Which Region would you prefer	Region 1	Region 2	No Preference
	*	*	*

*----------

ajbad2 **(Only if askj=2)**

*----------

You chose to move to the region with a higher cost of living.

You could have chosen a region with a lower cost of living that is alike in all other ways.

Are you sure you would prefer a region with a higher cost of living when you could move to a region with a lower cost of living?

Select one answer only

  * Yes, I'm sure that I prefer the region with higher cost of living
  * No, I'm not sure, ask the question again

*--
ajbad2x **(Only if ajbad2 = 1)**
*--
Why did you choose the region with the higher cost of living?

Select one answer only

* I would prefer to live in a region where it costs
  more to live, because I believe such a region would
  be a more enjoyable place to live.
* I do not believe that the region with a lower cost of
      living would actually have the same water quality.
* Another reason, not listed here.
* That was not the answer I intended, I would like to see
      the question again.

*--
ajbad3 **(Only if askj=3)**
*--
You indicated that you have no preference between two regions
whose only difference is that one has a lower cost of living than
the other.

Are you sure that you don't care whether you would move to a
region where it is more expensive to live when you could move to
a region where it is less expensive to live that is alike in all
other ways?

Select one answer only

  * Yes, I'm sure that I have no preference
  * No, I'm not sure, ask the question again

*--
ajbad3x **(Only if ajbad3 = 1)**
*--

Why do you have no preference between regions with different
levels of water quality?

Select one answer only

* I would not make a decision about moving on the basis of such small changes in cost of living.
* I do not believe that the region with a lower cost of living would actually have the same water quality.
* Another reason, not listed here.
* That was not the answer I intended, I would like to see the question again.

*----------
Nation1
*----------
1/2 of subjects are asked Nation1 - UseConj5 now
1/2 of subjects are asked Nation1 - UseConj5 after Conjoint5

For Nation1-11, if show national average in Defwat3, then replace "The entire United States is about 100 times the size of your region." **with** "The entire United States is about 100 times the size of your region and has an average water quality of 65% good".

(the 10% improvement tree is shown here)

Subjects will be split into four groups for these questions.
Group 1: $200 cost, 10% improvement
Group 2: $300 cost, 20% improvement
Group 3: $400 cost, 20% improvement
Group 4: $400 cost, 25% improvement

*----------

Suppose you could vote on a policy that you are sure would improve the water quality in every region of the country, including your own, by **10%.** The entire United States is about 100 times the size of your region.

This policy would increase the cost of living by **$200** per year nationwide.

Effect of Policy

Increase in Cost of Living	$200
Percent Increase Of Lake Acres and River Miles with Good Water Quality	10%

Would you be in favor of this policy?

Select one answer only

* Yes, I am in favor of this policy
* No, I am opposed to this policy
* I have no preference for whether this policy is done or not

*--
NationX (Only if Nation1=No Preference)
*--

You have indicated that you have no preference for whether
The policy is done or not.

Please briefly explain why you have no preference.

*--
Nation2 (Only if Nation1=Yes)
*--
Let's consider this policy question again, but with one change.

Suppose you could vote on a policy that you are sure would improve the water quality in every region of the country, including your own, by **6%** (instead of 10% in the previous question). The entire United States is about 100 times the size of your region.

This policy would increase the cost of living by **$200** per year nationwide.

Effect of Policy

Increase in Cost of Living	$200
Percent Increase Of Lake Acres and River Miles with Good Water Quality	6%

Would you be in favor of this policy?

Select one answer only

* Yes, I am in favor of this policy
* No, I am opposed to this policy
* I have no preference for whether this policy is done or not

*--
Nation3 (Only if Nation1=No)
*--
Let's consider this policy question again, but with one change.

Suppose you could vote on a policy that you are sure would improve the water quality in every region of the country, including your own, by **10%.** The entire United States is about 100 times the size of your region.

This policy would increase the cost of living by **$100** per year nationwide (instead of the $200 in the previous question).

Effect of Policy

Increase in Cost of Living	$100
Percent Increase Of Lake Acres and River Miles with Good Water Quality	10%

Would you be in favor of this policy?

Select one answer only

* Yes, I am in favor of this policy
* No, I am opposed to this policy
* I have no preference for whether this policy is done or not

*----------
Nation4 (Only if Nation2=Yes)
*----------
Let's consider this policy question again, but with one more change.

Suppose you could vote on a policy that you are sure would improve the water quality in every region of the country, including your own, by **4%** (instead of 6% in the previous question). The entire United States is about 100 times the size of your region.

This policy would increase the cost of living by **$200** per year nationwide.

Effect of Policy

Increase in Cost of Living	$200
Percent Increase Of Lake Acres and River Miles with Good Water Quality	4%

Would you be in favor of this policy?

Select one answer only

* Yes, I am in favor of this policy
* No, I am opposed to this policy
* I have no preference for whether this policy is done or not

*----------
Nation5 (Only if Nation2=No)
*----------
Let's consider this policy question again, but with one more change.

Suppose you could vote on a policy that you are sure would improve the water quality in every region of the country, including your own, by **8%** (instead of 6% in the previous question). The entire United States is about 100 times the size of your region.

This policy would increase the cost of living by **$200** per year nationwide.

	Effect of Policy
Increase in Cost of Living	$200
Percent Increase Of Lake Acres and River Miles with Good Water Quality	8%

Would you be in favor of this policy?

Select one answer only

* Yes, I am in favor of this policy
* No, I am opposed to this policy
* I have no preference for whether this policy is done or not

*----------
Nation6 (Only if Nation3=Yes)
*----------
Let's consider this policy question again, but with one more change.

Suppose you could vote on a policy that you are sure would improve the

water quality in every region of the country, including your own, by **10%.** The entire United States is about 100 times the size of your region.

This policy would increase the cost of living by **$150** per year nationwide (instead of the $100 in the previous question).

Effect of Policy

Increase in Cost of Living	$150
Percent Increase Of Lake Acres and River Miles with Good Water Quality	10%

Would you be in favor of this policy?

Select one answer only

* Yes, I am in favor of this policy
* No, I am opposed to this policy
* I have no preference for whether this policy is done or not

*----------
Nation7 (Only if Nation3=No)
*----------
Let's consider this policy question again, but with one more change.

Suppose you could vote on a policy that you are sure would improve the water quality in every region of the country, including your own, by **10%.** The entire United States is about 100 times the size of your region.

This policy would increase the cost of living by **$50** per year nationwide (instead of the $100 in the previous question).

Effect of Policy

Increase in Cost of Living	$50
Percent Increase Of Lake Acres and River Miles with Good Water Quality	10%

Would you be in favor of this policy?

Select one answer only

* Yes, I am in favor of this policy
* No, I am opposed to this policy
* I have no preference for whether this policy is done or not

*--
Nation8 (Only if Nation4=Yes)
*--
Let's consider this policy question again, but with one more change.

Suppose you could vote on a policy that you are sure would improve the water quality in every region of the country, including your own, by **2%** (instead of 4% in the previous question). The entire United States is about 100 times the size of your region.

This policy would increase the cost of living by **$200** per year nationwide.

Effect of Policy

Increase in Cost of Living	$200
Percent Increase Of Lake Acres and River Miles with Good Water Quality	2%

Would you be in favor of this policy?

Select one answer only

* Yes, I am in favor of this policy
* No, I am opposed to this policy
* I have no preference for whether this policy is done or not

*--
Nation9 (Only if Nation8=Yes)
*--
Let's consider this policy question again, but with one more change.

Suppose you could vote on a policy that you are sure would improve the water quality in every region of the country, including your own, by **0%** (instead of 2% in the previous question). The entire United States is about 100 times the size of your region.

This policy would increase the cost of living by **$200** per year nationwide.

Effect of Policy	
Increase in Cost of Living	$200
Percent Increase Of Lake Acres and River Miles with Good Water Quality	0%

Would you be in favor of this policy?

Select one answer only

* Yes, I am in favor of this policy
* No, I am opposed to this policy
* I have no preference for whether this policy is done or not

*----------
n9bad1 **(Only if nation9=1)**
*----------
You indicated that you would be in favor of a policy that increases your cost of living but has no effect on water quality.

Are you sure you would be in favor of such a policy?

Select one answer only

* Yes, I'm sure that I would be in favor of such a policy
* No, I'm not sure, ask the question again

*----------
n9bad3 **(Only if nation9=3)**
*----------
You indicated that you have no preference about a policy that increases your cost of living but has no effect on water quality.

Are you sure that you have no preference about whether such a policy was done?

Select one answer only

  * Yes, I'm sure that I have no preference
  * No, I'm not sure, ask the question again

*--
Nation10 (Only if Nation7=No)
*--
Let's consider this policy question again, but with one more change.

Suppose you could vote on a policy that you are sure would improve the water quality in every region of the country, including your own, by **20%.** The entire United States is about 100 times the size of your region.

This policy would increase the cost of living by **$25** per year nationwide (instead of the $50 in the previous question).

	Effect of Policy
Increase in Cost of Living	$25
Percent Increase Of Lake Acres and River Miles with Good Water Quality	10%

Would you be in favor of this policy?

Select one answer only

  * Yes, I am in favor of this policy
  * No, I am opposed to this policy
  * I have no preference for whether this policy is done or not

*--
Nation11 (Only if Nation10=No)
*--
Let's consider this policy question again, but with one more change.

Suppose you could vote on a policy that you are sure would improve the water quality in every region of the country, including your own, by **20%.** The entire United States is about 100 times the size of your region.

This policy would increase the cost of living by **$0**per year nationwide (instead of the $25 in the previous question).

	Effect of Policy
Increase in Cost of Living	$0

Percent Increase Of Lake Acres and River Miles with Good Water Quality | 10%

Would you be in favor of this policy?

Select one answer only

* Yes, I am in favor of this policy
* No, I am opposed to this policy
* I have no preference for whether this policy is done or not

*----------

n11bad2 **(Only if nation11=2)**

*----------

You indicated that you would be opposed to a policy that increases water quality but would have no effect on cost of living.

Are you sure you would be opposed to such a policy?

Select one answer only

* Yes, I'm sure that I would be opposed to such a policy
* No, I'm not sure, ask the question again

*----------

n11bad3 **(Only if nation11=3)**

*----------

You indicated that you have no preference about a policy that increases water quality but has no effect on cost of living.

Are you sure that you have no preference about whether such a policy was done?

Select one answer only

* Yes, I'm sure that I have no preference
* No, I'm not sure, ask the question again

*----------

defuse1

*----------

Water Quality Uses

It is possible for a lake or river to have good quality for one

use, but not for other uses. This means that a single region can have different levels of water quality for different uses or dimensions of water quality.
Some of the questions in this survey will ask you about three dimensions of the quality of lakes and rivers:

* Whether the fish in the lake or river are safe to eat,
* Whether the lake or river is a safe place to swim, and
* Whether the lake or river has a healthy aquatic environment.

*----------
defuse2
*----------

Fish Safe to Eat

A lake or river is good for fishing if eating fish caught in the lake or river will not make you sick.
A lake or river is not good for fishing if eating fish caught in the lake or river could make you sick.

How important is it to you that lakes and rivers in your region be good for fishing?

Select one answer only

* Not at all important
* Somewhat important
* Quite important
* Very important

*----------
defuse3
*----------

Swimming

A lake or river is good for swimming if prolonged contact with the water in the lake or river will not make you sick.
A lake or river is not good for swimming if prolonged contact with the water can make you sick.

How important is it to you that lakes and rivers in your region be good for swimming?

Select one answer only

* Not at all important
* Somewhat important
* Quite important
* Very important

*--
defuse4
*--

Aquatic Environment

The aquatic environment is good if the lake or river supports a healthy, balanced community of aquatic life, such as fish, plants, insects, and algae.

The aquatic environment is not good if the lake or river supports only some aquatic life, or cannot support certain kinds of aquatic life at all.

How important is it to you that lakes and rivers in your region have a good aquatic environment?

Select one answer only

* Not at all important
* Somewhat important
* Quite important
* Very important

*--
defuse6
*--

Because a region has more than one lake and river, these three dimensions of water quality will be described in terms of percent good.

For example, if all the acres of lakes and miles of rivers in a region are good for swimming and if half have a good aquatic environment, then that region could be described like this:

Percent of Water With Good Quality For Swimming:	100%
Percent of Water With Good Quality for Aquatic Environment:	50%

*--
UseConj0
*--

On each of the following five screens, you will be shown two policies that will improve or worsen different aspects of water quality in the entire country. The amount of improvement or decline for each policy may vary.

Please select one policy per screen that you would most prefer.

*--
UseConj1 - UseConj5
*--
Aspects: Swimming, Fishing, Aquatic Environment
Improvement: -5 %point,No change, +5 %point

Half of subjects replace the phrase "affect water quality in every region of the country, including yours," with "affect water quality in your region."

The current text for these questions always has lakes in Policy 1 and rivers in Policy2. For half of subjects, this will not change. For the other half, questions will always have rivers in Policy 1 and lakes in Policy 2
*--

Imagine that the government is considering policies that would **affect water quality nationwide** for recreational uses. The policies could have either positive, negative, or no effects on water quality for the three uses described earlier. The policies have a benefit that primarily affects either lakes or rivers.

Which of the two policies below would you prefer?

	Policy 1	Policy 2
Change in:	Lakes	Rivers
Fishing	+ 4%	0%
Swimming	0%	- 4%
Aquatic Environment	- 4%	+ 4%

Which Policy would you prefer	Policy 1	Policy 2
	*	*

*--
Timedisc
*--
1/2 of subjects get this text: "in your region" and "Both of these policies affect water quality in your region."(as shown)

1/2 of subjects get this text: "in the nation as a whole"

and "Both of these policies affect water quality in the nation as a whole."
[also remove second sentence "Imagine you have just moved… 65% Good"]

1/3 of subjects get 25% improvement in Policy 2
1/3 of subjects get 30% improvement in Policy 2
1/3 of subjects get 35% improvement in Policy 2

1/3 of subjects get 2 years from now in Policy 2
1/3 of subjects get 4 years from now in Policy 2
1/3 of subjects get 6 years from now in Policy 2
*----------

Some policies to improve water quality work right away and others take more time before they go into effect.

Imagine again that you have moved to another region of the country, where water quality is 65% Good.

Suppose two policies are being considered that improve water quality **in your region**.

Policy 1 will immediately improve water quality by **20%** (meaning water quality in the region would become **85% Good**).

Policy 2 will lead to a larger improvement in water quality, but the improvement would not occur immediately.

Once the policy is in effect, the improvement would last for five years, then water quality would return to its previous level.

Both of these policies affect water quality in your region.

Which of the two policies do you prefer?

	Policy 1	Policy 2
Improvement in water quality	20%	**25%**
Timing of improvement	Now	**2 years from now**

Which Policy would you prefer	Policy 1	Policy 2	No Preference
	*	*	*

*----------
Conjoint0

*--
On each of the following five screens, you will be shown three policies that will improve the water quality by various amounts **in a specific region**. The cost for each policy may vary. Please select one policy per screen that you would prefer.

*--
Conjoint1 - Conjoint5
*--

HALF OF SUBJECTS CONSIDER CHOICES IN THEIR REGION.
HALF OF SUBJECTS CONSIDER CHOICES IN THE ENTIRE COUNTRY.

ENTIRE COUNTRY SUBJECTS "IN YOUR REGION" WILL BE REPLACED BY "IN EVERY REGION OF THE COUNTRY, INCLUDING YOURS."

Subjects who considered national improvements in TIMEDISC consider national improvements in this question set

All subjects now start with water quality of 50% Good

The question is presented a total of 5 times, with the policies varying in the following ways:

Amount of Water Improvement:
5%, 10%, 15%, or 20%

Cost of Policy:
$100, $200, $300, or $400

Timing of improvement:
Now, 2 Year From Now, 4 Years From Now, 6 years from now

*--
Imagine again that you have recently moved to another region of the country, where water quality is **50% Good**.

Imagine that the government is considering several policies that would temporarily increase water quality **in your region**. Once the policy is in effect, the improvement lasts for five years, then water quality returns to its previous level. Regardless of when the improvement begins, the cost of each begins immediately and continues for 5 years.

Which of the three policies below would you most prefer?

	Policy 1	Policy 2	Policy 3

Year when Improvement Begins	Now	2 Year From Now	4 Years From Now
Amount of Water Improvement	5%	10%	15%
Cost of Policy Per Year	$100	$200	$300
Which Policy would you prefer	Policy 1 *	Policy 2 *	Policy 3 *

*----------

ConjDB

*----------

A subject should now be asked only one of these four questions (split evenly)

*----------

Suppose an improvement in water quality was promised in 6 years, how likely is it that the improvement would actually occur?

No Chance	Not likely	Even Money	Likely	Certain

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Suppose an improvement in water quality was promised in 4 years, how likely is it that the improvement would actually occur?

No Chance	Not likely	Even Money	Likely	Certain

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Suppose an improvement in water quality was promised in 2 years, how likely is it that the improvement would actually occur?

No Chance	Not likely	Even Money	Likely	Certain

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Suppose an improvement in water quality was promised immediately, how likely is it that the improvement would actually occur?

No Chance	Not likely	Even Money	Likely	Certain

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

*----------
demog0
*----------
That is all the questions we will ask you about water quality.

We would like to ask you some final questions about yourself.
*----------
drink
*----------
When you drink water at home, which of the following best describes what you do most often?

Select one answer only

* I drink tap water from the faucet.
* I filter tap water through a water filter.
* I drink bottled water.
*----------
smoke
*----------
In which of the following categories do you fit?

Select one answer only

* Current smoker
* Former cigarette smoker
* Never smoked cigarettes
*----------
Envorg
*----------
Are you a member of any of the following organizations?

Select all answers that apply

* Environmental Defense Fund

* Greenpeace

* National Audubon Society

* National Wildlife Federation

* Nature Conservancy

* Natural Resources Defense Council

* Sierra Club

* None of these

*--
Pret3
*--
How did you feel about the length of the survey?

Select one answer only

* Shorter than I expected
* About the right length
* Longer than I expected
* Too long
*--
Pret3b
*--
About how long did it take you to take the survey?

Select one answer only

* Less than 15 minutes
* 15 to 20 minutes
* 21 to 30 minutes
* 31 to 45 minutes
* 46 to 60 minutes
* More than an hour
*--
Pret4
*--
Did you have any problem understanding any of the
questions in the survey?

Select one answer only

* Many questions were unclear or confusing
* A few questions were unclear or confusing
* The questions were clear and understandable
- Some questions seemed overly simple

*---
Comments
*---
Do you have any comments on the survey in general?

Any comments welcome!

*---
endq
*---
You have reached the end of the survey. Thank you for
participating in our survey on water quality. Your answers
and the answers of other survey takers will be used to help
the government understand how you and others value water quality.
